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Original Research Article

Influence of dietary habits and physical activity on body mass index and dental caries in children of Visakhapatnam

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ABSTRACT

Background: Healthy diet and adequate physical activity are necessary for optimal growth of children. Dental caries is the most common disease in children, with diet being one of the contributing risk factors. Lack of physical activity in children also leads to weight gain, which may lead to systemic complications in adulthood. Hence the present study is designed to find out the association between dietary habits and physical activity with body mass index (BMI) and dental caries in children.
Methods: Children between 8–13 years attending the Department of Pedodontics, Gitam Dental College and Hospital were selected through convenience sampling for the survey. Children were given a printed questionnaire regarding the physical activity and individual food preferences. BMI and decayed, missing and filled teeth (DMFT) index of the individual subjects were calculated. Mean scores of the individual questions were tabulated and subjected to statistical analysis.
Results: There is no significant relation between physical activity and increased BMI. Poor dietary habits resulted in increased BMI, with increased junk food and fatty food intake and decreased consumption of vegetables and fruits being important risk factors. Environmental factors including age and gender are additional factors for prevalence of dental caries. Moreover, there is increased caries activity in children with lower BMI.
Conclusions: The findings of this study provided an insight into the oral health status, dietary habits and the changes in lifestyle of school going children in Visakhapatnam post COVID-19, which may be useful in designing and planning preventive oral health programs.

Keywords: Adolescents, Caries prevalence, COVID-19, Diet, Obesity, Physical activity

INTRODUCTION

Many health-related habits are adopted early in childhood and adolescence and most of them endure into adulthood. Gender, parental factors (e.g., family relationships, education, socioeconomic status) and lifestyle factors (e.g., regional customs, traditions, seasonal availability of food items) influence adolescents' general and oral health and related behaviours.[1] The school going ages form the foundation of future life in terms of physical, emotional and mental aspects and strongly influence the child's health in her/his adult life. Adequate and appropriate dietary intake is essential in this age for inculcating healthy eating habits so as to provide nutrients not just for the immediate growth, development and scholastic performance but also for long-term health.[2]

Increased rate of fast-food consumption has become a major exposure to obesity and overweight. Exposure to unhealthy eating habits has been reported as the major cause of weight gain among school children. The introduction of fast food in almost all developing counties is evidenced by the reported rise in obesity. Consumption

of low-nutrient and high intakes of sweets, desserts and high-fat dairy products are significantly related to higher rates of obesity in children. Eating habits plays a major role in influencing one's BMI and hence, quality of life.[3] Traditionally, physical activity has been an effective prevention and treatment strategy for adult obesity, but the recommended amount of physical activity is different for adults and children. The recommendation for adults is a minimum of 150 min/week of moderate exercise or a minimum of 75 min/week of vigorous exercise, but the recommendation for children is much higher: at least 60 min/day of physical activity (physical activity guidelines advisory committee, 2008). However, although studies have proven the effectiveness of physical activity among adults with obese weight, the relationship between children recommended physical activity and childhood obesity is still unclear.[4]

Dental caries is one of the most prevalent chronic diseases among children. Unhealthy diet, such as high calorie food, has been reported as a significant determinant of the increased prevalence of dental caries.[5] The development of caries is multifactorial, depending on many interacting variables to promote its development. In particular, the presence of bacteria, a substrate for the bacteria (food/sugars), the host's oral environment, as well as the passing of time are the main contributing factors in the formation of caries.[6] Difficulty in chewing, speech problems, poor attendance and impaired learning in schools can result from the complications of dental caries in children.[7]

Good oral hygiene is an important primary preventive procedure that can prevent dental caries. Children, who brush their teeth less than once a day and do not use fluoride toothpastes, are at a higher risk of dental caries. A suitable oral health behaviour during childhood perpetuates more effectively into adulthood.[8] All the above-mentioned factors are directly or indirectly related to one another. Taking all these into consideration, the present study is designed to find out the influence of dietary habits and physical activity on BMI and dental caries in children residing in Visakhapatnam.

METHODS

A total of 397 children are selected through convenience sampling for the survey. Children between 8–13 years age group attending the Department of Pedodontics and Preventive Dentistry, Gitam Dental College and Hospital, Visakhapatnam, during May 2021 to October 2021 were included. The sample size is further divided based on the age group into children (8-10 years) and early age adolescents (11-13 years). Children and parents unwilling to participate in the survey are excluded.

Data collection

Oral consent was taken from the parents after explaining about the purpose and procedure of the study in their own native language. Anthropometric measurements were done and each child was given a printed questionnaire regarding physical activity and individual food preferences.

Anthropometric measurements included height and weight. Height was measured to the nearest 0.1 cm using Stature meter. Weight was measured to the nearest 0.1 kg using digital weighing machine. BMI of the individuals was calculated using these measurements. The children were categorised as underweight, healthy and overweight.

To obtain data on physical activity of the study participant's, questions according to Physical Activity Questionnaire (PAQ) were used. To obtain data on study participant's dietary habits, food frequency method was used. Five food categories (vegetables, fruits, meat, milk products and beverages) were included in the questionnaire to study the dietary preferences of the child. Questions on sweet consumption, snack consumption, restaurant visits and oral hygiene practices are also included. The children are assisted to answer the questions.

After the data is collected, the values are tabulated and subjected to statistical analysis. One way ANOVA and post hoc tests are used to analyse the data.

RESULTS

Out of 397 children, 208 (52.3%) were girls and 189 (47.6%) were boys. Based on age grouping, 182 (45.8%) are of 8 -10 years and 215 (54.1%) are of 11–13 years.

Physical activity and body mass index

Most of the children were leading a sedentary life style (59.6%). Out of 81 children who have an increased BMI, 41 (50.6%) are involved in less physical activity and 40 (49.3%) are involved in more physical activity. Out of 243 children who have a normal BMI, 151 (62%) involved in less physical activity and 92 (37.8%) are involved in more physical activity. Out of 73 children who have decreased BMI, 52 (71.2%) are involved in less physical activity and 21 (28.7%) are involved in more physical activity. (Table 1)

Dietary habits and body mass index

109 out of 397 children consume sweets/ chocolates 3-4 times a day. In this 21 (19.3%) have less BMI, 63 (57.8%) have a normal BMI and 25 (22.9%) have an increased BMI. 148 out of 397 children consume sweets/ chocolates occasionally.

In this, 22 (14.9%) have less BMI, 93 (62.8%) have normal BMI and 33 (22.3%) have an increased BMI. The mean increase in BMI due consumption of dairy foods, fruits, vegetables, meat and cereals and beverages is 2.35, 2.76, 2.61, 2.38, 3.05.

Dietary habits and dental caries

Out of 205 children who have caries activity, 65 (31.7%) consume sweets/ chocolates 3-4 times a day, 70 (34.1%) consume sweets/chocolates once a day and 70(34.1%) consume sweets/ chocolates occasionally. Out of 205 children who have dental caries, 16 children (7.8%) consume sweets along with meals and 189 children (92.2%) consume sweets in between meals. The percentage of increased caries activity in children eating fatty food daily at home is less (25.4%) compared to those eating fatty food outside home (53.2%). The mean caries prevalence due to consumption of dairy foods, fruits, vegetables, meat and cereals and beverages is 2.28, 2.71, 2.70, 2.43 and 3.0.

Prevalence of dental caries

Based on gender, prevalence of dental caries is more in girls (53.2%) than boys (46.8%). Based on age groups, caries prevalence is more in 8-10 years age group (57.1%) than 11-13 years age group (48.3%). Caries incidence in boys is more (58%) compared to girls (56.4%) in 8-10 age group. Difference in caries activity in girls and boys of 11-13 years in not of much significance. (48.5% in girls and 48.1% in boys).

Body mass index and dental caries

Out of 397 children, 73 (18.4%) have a low BMI, 243 (61.2%) have a normal BMI and 81 (20.4%) have increased BMI. Out of 73 children with low BMI, caries activity is present in 45 (22%) and 28 (14.6%) are caries free. Out of 243 children with normal BMI, caries activity is present in 130 (63.4%) and 113 (58.9%) are caries free. Out of 81 children with increased BMI, caries activity is present in 30 (14.6%) and 51 (26.6%) are caries free.

Oral hygiene practices and dental caries

Out of 397 children, 256 (64.4%) brush their teeth once a day and 141 (35.5%) brush their teeth twice. Out of 256 children who brush their teeth once a day, only 121 (47.2%) are caries free, whereas out of 141 children who brush their teeth twice a day, 71 (50.3%) are caries free.

Table 1: Relation between physical activity and BMI.

	Under weight (BMI below 3rd percentile)	Healthy (BMI between 3rd-90th percentile)	Over weight (BMI above 90th percentile)
Less physical activity	52 (71.2%)	151 (62%)	41 (50.6%)
More physical activity	21 (28.7%)	92 (37.8%)	40 (49.3%)
Total	73 (100%)	243 (100%)	81 (100%)

DISCUSSION

The health, physical growth, development and educational performance of school children depend largely on good nutrition.[2] Overweight and obese children can have several systemic disorders such as high blood pressure, impaired glucose intolerance, respiratory problems, psychological disturbance and poor quality of life. Likewise, untreated dental caries in permanent dentition affected 2.4 billion people worldwide in 2015 and its prevalence was the highest in adolescents.[7] Physical activity habits developed during school years can go a long way later in life and contribute in amelioration of non-communicable disease burden at national and international level. The problem of overweight and obesity due to reduced physical activity is often referred to as a result of "westernization" which includes increasing use of electronic goods and screen time and changing consumer and dietary pattern.[9] The result of the present study states that the relation between dietary habits and BMI was significantly seen in groups having more sweets and chocolate consumption compared to those who consume fruits and vegetables which may be due to high sugar content in sweets and vegetables and also the fructose content present in sugars increases the level of uric acid which results in hyperinsulinaemia which is important factor for obesity and frequent consumption of these foods lead to increased weight gain which is similarly quoted in the study done by Morenga et al in 2013.[10] As mentioned earlier in the results, dental caries is more in children when sweet consumption was done between the meal time rather than those who consume sweets along with meals. This result was similar to the study conducted by Munjal et al in 2018.[11]

When authors look at the relation between physical activity and BMI, there was no significant relation and Tanaka et al 2018 in their study on association between obesity and physical activity mentioned that obesity may result in sedentary behaviour or low physical activity but low physical activity is not a contributing factor for obesity.[12] There is also negative correlation between dental caries and BMI. This may be attributed to the reason that in children with high dental caries activity, the quantity of food taken is reduced thereby reducing the quality of food intake reducing BMI. Similar results were also seen in the study conducted by Liang et al in 2016 and Cheng et al in 2019.[5,13] Prevalence of dental caries is more in girls compared to boys. This may be because in girls, permanent teeth erupt earlier and also salivary flow rate and salivary IgA levels are reduced in girls compared to boys. And also in age groups, 8-10 years age group children are having more caries than 11-13 years age

group. This is because of most of the parental attitudes that primary teeth are soon replaced by permanent teeth and therefore restoration of primary teeth is not that important and also, the teeth in erupting stage are susceptible to caries than the teeth which are in occlusion and also the recently erupted teeth have deep pits and fissures which is more susceptible factor for causation of dental caries and also as the age increases, the awareness for oral hygiene increases and thereby reduced caries activity in 11-13 years children. Similar results are also seen in the studies conducted by Ferraro et al in 2010 and Goenka et al in 2018.[6,14]

Limitations

The study was performed on a small geographic location. Dietary assessment of school going children may be difficult as children due to limited attention span and issues of recall and cognitive abilities for self-reporting may not be able to provide accurate responses. Dental caries detection was carried out visually and no X-rays were taken, thus the prevalence of dental caries and DMFT value might be underestimated.

CONCLUSION

It is concluded from this study that there is no significant relation between physical activity and increased BMI. Poor dietary habits resulted in increased BMI, with increased junk food and fatty food intake and decreased consumption of vegetables and fruits being important risk factors. Individual dietary preferences also play an important role in activity of dental caries. Environmental factors including age and gender are additional factors for prevalence of dental caries. However, there is negative/ no correlation between dental caries and increased BMI. Moreover, there is increased caries activity in children with lower BMI. Awareness on healthy diet, good oral hygiene practices and adequate physical activity should be provided to children.

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