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Original Article

The association of body mass index with dental caries in an Iranian sample of children

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Abstract

BACKGROUND: Caries is an infectious disease that is induced by the diet. Despite its decline in all age groups on a worldwide basis, it is still a serious public health problem in children and its control should be a priority. It has been demonstrated that dental caries can gradually reduce children's weight gain, which may be reversed after complete oral rehabilitation. The main aim of this study was to examine the relationship between dental caries and body mass index (BMI) in a sample of young children in Iran.

METHODS: A random sample of 420 children aged 6 years was examined for dental caries using WHO standard diagnostic criteria. Decayed, missing and filled of primary teeth (dmft) and permanent teeth (DMFT) were recorded. The children's weight and height were measured using standard digital scales by two trained examiner and their BMI were calculated BMI and dental caries categoris association was tested by chi- square analysis.

RESULTS: The mean decayed, missing and filled teeth score of the study population was 4.70 ± 3.4. Only 9% of the children were underweight and 6% were obese when they were compared with WHO standard of BMI for children with the same age. There was a significant association (P = 0.04) between BMI and dental caries categories.

CONCLUSIONS: An association was observed between DMFT and BMI of participants. The relationship should be investigated by further longitudinal studies.

KEY WORDS: Body Mass Index, dental caries, children.

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Dental caries is a multi-factorial disease that affects most populations throughout the world. It is the primary cause of oral pain and tooth loss.[1] It is a major problem in young children. Caries of the primary teeth or early childhood caries (ECC) is one of the most prevalent health problems in infants and toddlers.[2] It can be considered an epidemic in lower income families and in under developed parts of the world.[3] ECC is one of major causes of hospitalization in young children who often must receive general anesthesia for extraction or tooth restoration.[4]

Growth is a critical indicator of child health and its importance is recognized by the World Health Organization (WHO) which identifies growth assessment as the best single measure for defining the nutritional status and health of children as well as being an indicator of the quality of life in whole population.[5] The role of diet and nutrition in growth and dental caries is well known and poor growth, obesity and childhood caries are three substantial public health problems. It has been well documented in animals that early malnutrition affects tooth development and eruption and can result in increased dental caries later in life.[6] There are two important aspects to the relationship, food

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choice and nutrient intake both may affect and be affected by poor dental health.

Relationship between poor growth and dental caries has been reported by many studies. The mean weight of children with carious teeth was less when they were compared with matched groups.[7-9] Improvement in growth factors was observed after dental rehabilitation in other studies which some growth indicators such as weight, height or body mass index (BMI) were compared before and after intervention.[10-14] It appears that the chronicity of childhood caries may have the same influence on a child's ability to sustain normal growth patterns as any other chronic disease or infection, and therefore caries may impact upon general health and well being. On the other hand, obese children usually have a rich carbohydrate regime which could make them susceptible to more carious teeth.[15]

Some studies investigated relationship between BMI and dental caries in Iranian children but used a wide age range or very young children.[16,17] Therefore, this study aimed to evaluate association between BMI and dental caries in an Iranian sample of children at age of 6 year old. Childhood caries has shown their full effect at this age. In addition, a representative sample of this age group could be more possible through primary school entrance health assessment program.

Methods

A random sample of children was recruited among those who underwent health assessment at the beginning of the first level of education at primary school in Kerman city (Iran) in 2011. Parents signed a consent form and completed a piloted questionnaire after acquiring information about the aims of the study. Some socio-demographic data were collected through the questionnaire including questions regarding parents' education, child order in family, number of family members, parents' job, type of insurance and its coverage for dental treatments. Medical history was taken for past and present systemic diseases and medications.

Two trained and calibrated dentists did dental examination in different site of medical screening alternatively in morning and afternoon. Inter-examiner reliability test showed high agreement (Kappa = 80%). There were 5 sites in two local authority education areas in Kerman city and the examiners visited each site on a scheduled time table to recruit a defined random sample of all areas. Dental examination was based on WHO criteria for dental status.[18] Gingiva was observed by the examiners for any sign of inflammation or calculus. Any sign of other problems in mouth and teeth were recorded. All examination was done under natural light using disposable mirror and a dental probe was used to clean debris and plaque from tooth surfaces.

Children with history of systemic diseases which may affect their growth were excluded from correlation analysis. Child birth condition was also asked from parents. Children weight and height were measured with a calibrated digital scale (SECA 888 Digital Scale, Germany) and a wall stand meter, by a trained health visitor. The scale was calibrated at the beginning of each working day and also at frequent intervals throughout the examination. Measurements were done with light cloths and without shoes. BMI of the children were calculated as weight in kg divided by height in meter square (m^2) and then compared with WHO standard growth reference for the same age.[19] Data were analyzed using SPSS software version 17.5.

Decayed, missing and filled of primary teeth (dmft) and permanent teeth (DMFT) were recorded. DMFT/dmft scores were calculated and then children were categorized into four groups on the basis of WHO severity caries classification as follows:

1. < 3 DMFT/dmft: low caries level
2. 3.1-4.5 DMFT/dmft: moderate caries level
3. 4.6-6.9 DMFT/dmft: high caries level
4. > 7 DMFT/dmft: very high caries level

BMI of children were also categorized based on WHO standards for children at the same age as follows:

1. BMI < 13.25: underweight for age

2. BMI 13.26-17.5: normal for age
3. BMI 17.5-18.55: over weight for age
4. BMI > 18.5: obese for age

Relation between the BMI groups and categories of DMFT scores were analyzed using chi-square test. Association between DMFT/dmft and some socio-demographic factors were tested by Pearson correlation coefficient.

Results

Four hundred and twenty children were examined. Some subjects were excluded from analysis due to incomplete data. The data of 407 subjects were analyzed for descriptive results including 223 (54.8%) boys and 184(45.2%) girls. Seventy and seven percent (317 subjects) were insured and social welfare type was the most frequent one (44%).

Table 1 shows the parents education level and their job condition. The most frequent child order in family was the first child with 44% and about 10% were more than the third one. Fifty three percent (217 subjects) of children were born by natural birth and about 46% by cesarean section. Three percent of subjects (n = 13) had a history of asthma and 1.2% had a history of some other systemic diseases. Six subjects with history of systemic diseases were excluded from correlation analysis.

Ninety percent of children had normal gingiva and there was no other problem in the study subject' mouth. Mean DMFT/dmft of study participants were 4.70 ± 3.4 and decayed teeth were the main component of index with mean of 3.85 ± 3.0. Table 2 shows the mean of DMFT/dmft score, weight, height and BMI by gender.

Figure 1 and 2 shows the number of the subjects in each BMI and DMFT/dmft category, respectively. Thirty and seven (9%) children were underweight for their age and 117 (28.8%) were in very high caries category. Fifteen children with very high caries level were underweight for their age.

There was a significant relationship between BMI category and DMFT/dmft score (P = 0.044, Table 3). There was a weak positive correlation between DMFT/dmft score and child order in family (r = 0.14) as well as family size (r = 0.11). No relationship was found between type of birth condition, parent's job and education and DMFT/dmft categories and between insurance coverage and DMFT/dmft ratio.

Table 1. Education level and job situation of participants

Education level	No education	Primary school	High school	Degree level	Total
Father	94 (23%)	88 (22%)	137 (33%)	88 (22%)	406 (100%)
Mother	87 (21%)	69 (16.8%)	171 (42%)	62 (19%)	407 (100%)
Job	No job	Official	Non Official	-	
Father	10 (2.4%)	154 (37%)	239 (58%)	-	403 (100%)
Mother	321 (78%)*	68 (16.6%)	17 (4.2%)		406 (100%)

* Housewife

Table 2. Mean DMFT/dmft score, weight, height and body mass index of study participants by gender

	Mean (± SD)		
	Boys (n = 223)	**Girls (n = 184)**	**Total (n = 407)**
DMFT/dmft	4.73 ± 3.4	4.65 ± 3.4	4.70 ± 3.4
Weight (kg)	20.8 ± 3.9	20.0 ± 4.0	20.4 ± 4.0
Height (cm)	116.3 ± 4.6	115.1 ± 5.1	115.7 ± 4.9
BMI (kg/m^2)	15.3 ± 2.3	15.1 ± 2.0	15.2 ± 2.2

BMI: Body mass index

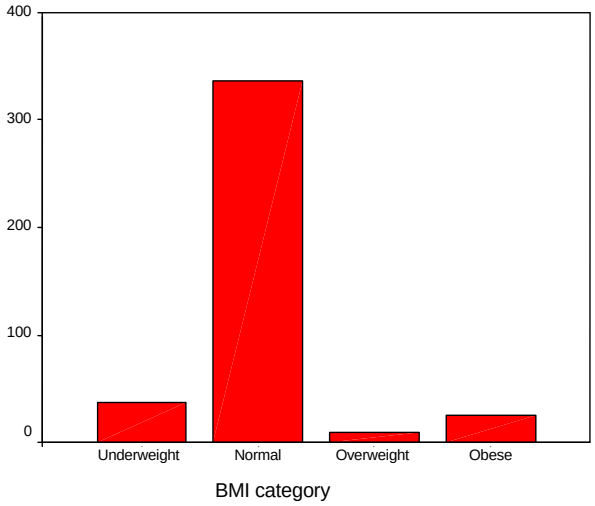

Figure 1. Frequency of study participants in each body mass index category

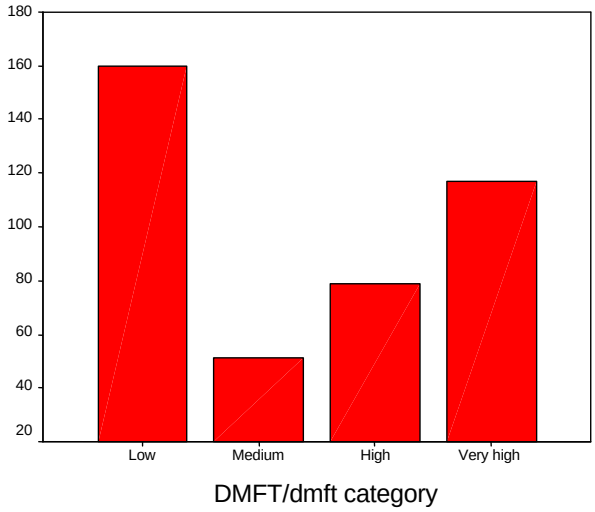

Figure 2. Frequency of study participants in each DMFT/dmft category

Table 3. Cross tabulation body mass index and DMFT/dmft categories among participants

		DMFT/dmft category				Total
		Low	Medium	High	Very high	
BMI categories	Underweight	8	3	11	15	37
		21.6%	8.1%	29.7%	40.5%	100.0%
	Normal	127	41	57	92	317
		40.1%	12.9%	18.0%	29.0%	100.0%
	Overweight	2	1	3	3	9
		22.2%	11.1%	33.3%	33.3%	100.0%
	Obese	16	2	5	2	25
		64.0%	8.0%	20.0%	8.0%	100.%
Total		153	47	76	112	388
		39.4%	12.1	19.6%	28.9%	100.0%

x^2 = 0.04 (Significant)
BMI: body mass index

Discussion

Current researches in dental public health try to explore the link between oral health and general health as an effective way of underscoring the public health impact of oral care and influencing health care policy. This study showed a relationship between the dental caries and BMI among a group of children in Kerman city. Existence of a link between growth and oral health in children is controversial and it has been investigated by many researchers throughout the world.

BMI is an index which its use as growth indicator is also controversial but it has been widely used in the field of dentistry, especially in studies about obesity and dental caries. Obesity is a health problem all over the world and some studies from Iran reveals that the prevalence of obesity among Iranian children has been increased which could be attributed to the changes in lifestyle.[20,21] On the other hand, faltering growth is also a substantial health problem which affects many children worldwide.

About 9% (37 subjects) of study subjects showed low BMI (underweight) and 6% (25 subjects) were obese when their BMI were compared to WHO standard for the same age. A similar German study of 1290 children of elementary schools showed 3.6% of the children were underweight, 74.8% had a normal weight, 11.9% were overweight, and 9.7% were obese.[22] The findings of a study in Isfahan showed that 16% of the children had a normal weight, 16.9% were at risk of overweight, and 67.1% were overweight.[16] In another study BMI of 27.1% of Filipino children was below normal and 1% had a BMI above normal.[9] These differences among the reports might be related to diversity of study subjects as this study investigated the children in a single age (6 years old). Indeed, different studies used a variety of standard BMI reference for comparing the growth data. However, there is no National standard chart for growth of Iranian children and it may show some variation in growth pattern of the children with WHO standard. Therefore, our findings should be interpreted cautiously.

The mean DMFT/dmft score of the study subjects was 4.70. It is close to the results of national oral health survey in Iran in 2003 which was 4.83 for this age group in Kerman but it is less than the average in whole country which was 5 for this age group.[23] However, it is still high from public health perspective.

An association between dental caries and growth in children has been proposed by some preliminary and population-based studies.[24-26] Our findings showed a correlation between BMI score and dental caries in 6 years old Iranian children, which confirms some previous studies.[22,24] However, a number of studies did not find a positive relationship between growth factors and caries experiences.[16,27-31]

The relationship between childhood growth and dental caries is complex and varies depending on many factors, such as age, gender, race, and other social factors and most of the published literature represented diverse populations. Low BMI and high dental caries are still two public health problems which some studies showed might be associated.[8,32,33] Growth and dental caries could be associated trough some dietary pattern and also some metabolic mechanism. High sugar diet intake could result in obesity and dental caries. On the other hand, metabolic factors form dental pain and infection could be a reason for poor growth.

In this study about 40% of underweight children were in very high caries group who need special attention from both aspects. They might need intervention for oral rehabilitation which may tend to weight gain on them. Some clinical studies showed improvement in growth indicators[10-14] after dental rehabilitation especially in undergrowth group. This needs to be investigated in Iranian children and at a community level in further researches. Indeed, this study had a cross-sectional design, which limits the ability to identify causality. Therefore, a longitudinal design would be needed to reveal cause and affect relationships in this regard.

Conclusion

The findings of this study indicated an association between BMI and dental caries which could suggest that health care providers are

obligated to seek novel methods by which they can affect their pediatric patients through oral screening. However, it has been suggested that dentists may be ideally placed to recognize children at risk of poor growth and obesity. It is critical for dental professional to be aware of epidemiology of obesity and faltering growth in children, as many of these children will require significant dental care program. Therefore, the impact of growth on total health should be emphasized within dental school curricula and also pediatrician and nutritionist should be aware of the role of oral health in growth of children.

Conflict of Interest

Authors have no Conflict of Interest.

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