Caries Risk Assessment in Children Aged 6-12 years based on Parental Knowledge and Its Relationship with BMI and DMFT in Ahvaz

Leila Basir[1], Targol Amini[2], Shabnam Rasti[3]

[1]Associate professor, department of Pediatric Dentistry, School of dentistry, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran, [2]Pediatric dentistry Resident, Pediatric Department, Faculty of Dentistry, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran, [3]Pediatric dentistry Resident, pediatric department, faculty of dentistry, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran

Abstract

Background: The prevalence of dental caries in childhood is one of the problems related to children's oral health. The aim of this study was to determine the risk of caries in children aged 6-12 years based on parental information and its relationship with BMI and DMFT in Ahvaz.

Methods and materials: The necessary permits were obtained from the Ahvaz Education Department, and then 300 samples of the city's primary schools were selected. Students were examined with a disposable dental mirror and the number of decayed, missed, and restored permanent and deciduous teeth was recorded in the DMFT table. After that, the questionnaire was completed with the help of parents. The validity of this questionnaire was confirmed by 5 pediatric dentists and the reliability of this questionnaire was confirmed by conducting a pilot study on 10 children based on Cornbach coefficient of 0.85.

Results: Maternal occupation was associated with moderate caries risk ($p = 0.007$). Economic situation was associated with low risk ($p = 0.0001$). The mean weight of the child in the high risk group was significantly higher than the low risk groups ($p < 0.001$) and medium risk ($p < 0.001$). The mean DMFT in the low risk group was significantly lower than the medium risk ($p < 0.001$) and high risk groups ($p < 0.001$). The mean BMI in the high risk group was significantly higher than the medium risk groups ($p < 0.001$) and low risk ($p < 0.001$).

Conclusion: Economic status, mother's job and child's weight are associated with caries risk. Also, DMFT and BMI index have a direct and significant relationship with the risk of caries.

Keywords: *Caries risk assessment (CRA), DMFT, BMI*

Introduction

Tooth caries are the most common infectious disease in human societies.[1] Scientists have focused more on caries prevention and have achieved significant success in this regard.[2] One of the topics that has always been considered and questioned by researchers has been the issue of predicting the occurrence of caries using risk factors for this complication and great successes have been achieved.[3] Given that caries is a multifactorial and complex disease; therefore, various researchers have tried to determine the susceptibility of people to tooth decay by examining each of the caries factors and their impact on the incidence of this complication, and thus predict future dental caries.[4]

The causing factors of caries including cariogenic microorganisms, fermentable carbohydrates, and susceptible hosts have been reported.[5,6] In addition, ecologically, tooth decay, like other diseases, is due to

Corresponding Author:
Targol Amini
targol.amini@iran.ir

an imbalance between the attacking agent that causes the primary lesion, and the inherent or acquired factor that changes the strength and susceptibility of the enamel. And the modifying factor that is present in the environment adjacent to the teeth, called plaque and saliva.[7] Some types of foods and eating habits can increase the risk of weight gain and tooth decay in children.[8] Therefore, nutritional patterns among obese children may be considered as a risk factor for obesity and dental caries.[9]

Todays, there are two strategies for preventing disease: Whole population strategy and High risk strategy. Experience and research have shown that in the first type of prevention, most of the prevention costs that are spent on low risk people are actually wasted;[10-11] so during the last two decades, the attention of prevention experts has been attracted to high risk strategy.[12] Caries Risk Assessment (CRA), which is performed to identify people at risk of caries, has received a great deal of attention in research centers and dental schools over the past 20 years, and many dental schools around the world are performing this evaluation.[13]

Performing CRA for all children, especially primary school children who are in mixed dentition period and need special care, can pave the way for faster achievement of prevention goals while identifying susceptible individuals. The aim of this study was to determine the risk of caries in children aged 6-12 years based on parental information and its relationship with BMI and DMFT in Ahvaz.

Methods and Materials

In the present descriptive epidemiological study, samples from primary schools in the city were selected by multi-stage cluster sampling method (300 people). Exclusion criteria of this study include unwillingness to cooperate, children with inherited and acquired underlying diseases.

Students were examined with a disposable dental mirror and the number of decayed, missed, and restored permanent and deciduous teeth was recorded in the DMFT Table 1. The DMFT index indicates the number of decayed permanent teeth (D), lost due to decay (M), and restored due to decay (F), and the higher the number, the worse the oral health and the lower the culture of prevention in society.[14]

The questionnaire, which was written based on McDonald's Children and Adolescents Dental Book 2016[5] and Pinkham 2019,[15] was completed with the help of parents. The validity of this questionnaire was confirmed by 5 pediatric dentists and the reliability of this questionnaire was confirmed by conducting a pilot study on 10 children based on Cornbach coefficient of 0.85.

The questionnaire consists of 2 parts:

1- Demographic and background information questionnaire that includes questions about age, parents 'education, parents' occupation, economic status, birth rank, number of visits to the dentist, oral hygiene, fluoride consumption, consumption of different types Sweets and dates of the last filled teeth

2- The second part of the questionnaire was prepared based on the guidelines of the American Association of Pediatric Dentists to assess the risk of caries. This guide consists of three main sections, which include biological, protective, and clinical findings.

This study has been approved by the ethics committee of Ahwaz University of Medical Sciences. The study process was explained to all parents and informed consent was obtained from them.

After data collection, SPSS software version 20 and analysis of variance ANOVA and Tukey, chi square were used to analyze the data. Values of $p < 0.05$ were considered as significant levels.

Results

There was no significant difference in caries risk ($p < 0.05$) with the variables of Parent's education, father's occupation, gender, number of siblings, immigration, Seat belt, low birth weight, high birth weight, comorbidities, drug use, child age, mother age, father age, child height. Maternal occupation was associated with moderate caries risk ($p = 0.007$). Economic situation was associated with low risk ($p = 0.0001$). The mean weight of the child in the high risk group was significantly higher than the low risk groups ($p < 0.001$) and medium risk ($p < 0.001$). The mean weight of the child was not significantly different between the two groups of moderate and low risk ($p = 0.548$) (Table 1 and Figure 1).

Table 1. Description and comparison of the frequency/ mean of the demographic variables of the subjects based on the risk groups.

Background variables		High risk group	Moderate risk group	Low risk group	P
		Frequency(%) / mean±SD	Frequency(%) / mean±SD	Frequency(%) / mean±SD	
Total Number		164	104	32	0.0001*
Mother's education	Under diploma	46(28%)	33(31.7%)	12(37.5%)	0.345NS
	Diploma	62(37.8%)	39(37.5%)	15(46.9%)	
	university	56(34.1)	32(30.8%)	5(15.6%)	
Father's education	Under diploma	51(31.1%)	33(31.7%)	13(40.6%)	0.163NS
	Diploma	56(34.1%)	45(43.3%)	7(21.9%)	
	University	57(34.8%)	26(25%)	12(37.5%)	
Mother's job	Housewife	62(37.8%)	19(18.3%)	13(40.6%)	0.007*
	Employee	53(32.3%)	48(46.2%)	8(25%)	
	Self-employed	49(29.9%)	37(35.6%)	11(34.4%)	
Father's job	Employee	55(33.5%)	30(28.8%)	9(28.1%)	0.432NS
	Self-employed	59(30.5%)	34(32.7%)	15(46.9%)	
	Unemployed	50(30.5%)	40(38.5%)	8(25%)	
Economic status	Below 2.5	24(14.6%)	0(0%)	2(6.3%)	0.0001*
	2.5-5	105(64%)	92(88.5%)	14(43.8%)	
	Above 5	35(21.3%)	12(11.5%)	16(50%)	
Gender	male	81(49.4%)	40(38.5%)	17(53.1%)	0.15NS
	female	83(50.6%)	64(61.5%)	15(46.9%)	
Siblings number	1	46(28%)	27(26%)	11(34.4%)	0.965NS
	2	42(25.6%)	28(26.9%)	7(21.9%)	
	3	36(22%)	25(24%)	8(25%)	
	4	40(24.4%)	24(23.1%)	6(18.8%)	

Cont... **Table 1. Description and comparison of the frequency/ mean of the demographic variables of the subjects based on the risk groups.**

migration	yes	13(7.9%)	4(3.8%)	5(15.6%)	0.075NS
Seat belt		70(42.7%)	51(49%)	16(50%)	0.52NS
Premature birth	yes	6(3.7%)	3(2.9%)	0(0%)	0.538NS
	No	158(96.3)	101(97.1%)	32(100%)	
Underweight at birth	yes	11(6.7%)	7(6.7%)	0(0%)	0.319NS
	no	153(93.3%)	97(93.3%)	32(100%)	
comorbidities	yes	6(3.7%)	4(3.8%)	4(12.5%)	0.084NS
	no	158(96.3%)	100(96.2%)	28(87.5%)	
drug	yes	4(2.4%)	2(1.9%)	3(9.4%)	0.080NS
	no	160(97.6%)	102(98.1%)	29(90.6%)	
Child age		8.99±2.02	8.83±2.02	9.56±1.89	0.195NS
Mother age		32.99±1.89	33.22±1.69	32.84±1.74	0.463NS
Father age		39.29±1.75	38.87±1.61	39.34±1.70	0.113NS
Child height		134.55±3.21	135.13±3.03	135.72±3.47	0.1NS
Child weight		29.77±4.41	26.16±2.48	26.91±3.33	0.0001*

Fluoride levels, fluoride toothpaste, fluoride treatment, dentist, toothache, overnight breastfeeding, Teeth sucking, Tooth hurt, Timely growth, Tooth disorder, Decay treat ex, bruxism, Sugar drink food, Clean tooth gum, Brushing supervision Tooth brushing, Untreated mom, Untreated dad, Child tooth decay, Brushing together and Common dishes did not differ significantly in different caries risk groups ($p < 0.05$). The mean DMFT in the low risk group was significantly lower than the medium risk ($p < 0.001$) and high risk groups ($p < 0.001$). The mean DMFT level was not significantly different between the moderate and low risk groups ($p = 0.869$)

The mean BMI in the high risk group was significantly higher than the medium risk ($p < 0.001$) and low risk groups ($p < 0.001$). The mean BMI was not significantly different between moderate and low risk groups ($p = 0.735$).

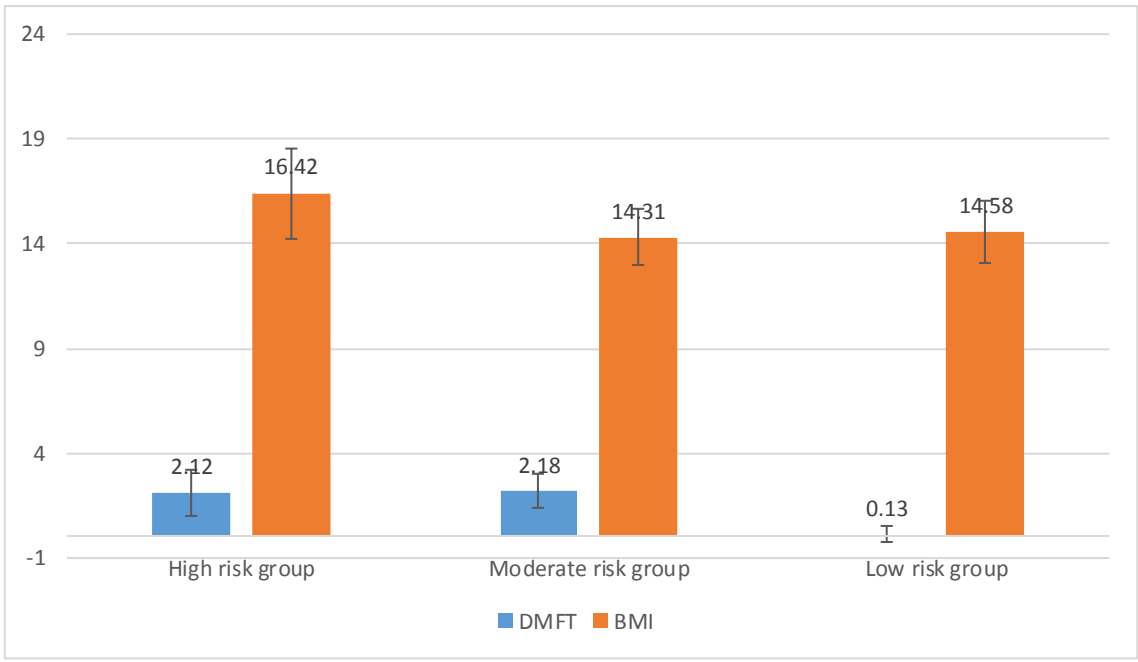

Figure 1. Comparison of the mean±SD of body mass index (BMI) and decay-missing-fill index (DMFT) among various study groups.

Discussion

The issue of caries prediction over the past two decades has been the focus of researchers and experts in prevention.[16] The average DMFT increases with the risk of caries; so by being low risk, this index has a lower number than being the medium and high risk;[17] so the higher DMFT in patients with high caries risk indicates a direct and effective relationship between environmental factors and dental caries.

The findings of the present study showed that economic status, maternal occupation and child weight are associated with low, moderate and high caries risk status. Along with the present study, in the study of Khodakarami et al., the level of education of mothers had a significant relationship with students' attitudes toward oral health. In the study of Shirazi et al., The mother's education had significant effects on dental plaque index.[18] According to a study by Farsi et al., Previous caries, enamel demineralization, and socioeconomic status are important risk factors for caries. Although in the present study, economic status was associated with low caries risk status;[19] but it can be said that the results of this study are in line with our study.

Although Pourhashemi in his study did not find a significant relationship between children's dental health in the study area with occupation and level of education,[20] but in the present study similar to the studies conducted in Iran and other countries,[21,22] a significant relationship was found between the variable of maternal education and caries risk.

In the study of Pinto et al, the research on children, no significant relationship was shown between tooth decay and their weight.[23] Also, Kopycka-Kedzierawski et al, did not report a significant relationship between tooth decay and the risk of overweight in American children aged 2-18 years.[24] In a systematic study, Kantovitz et al identified only one study that had sufficient evidence to determine the association between weight and dental caries.[25] However, in the present study, it was found that with increasing BMI, the risk of caries also increases, so that in the high risk group, this rate is higher than the average and low risk groups.

On the contrary, the study of Yousefi et al acknowledged that the dmft + DMFT index has an inverse and significant relationship with the body mass index of children.[26] In the study of Pourhashemi et al, there was no clear relationship between body mass index

and childhood caries; in some cases, with increasing body mass index, the frequency of caries increased and in some cases decreased.[20] In a study by Sheller et al, examining the relationship between body mass index and childhood caries in the United States, there was no association between dmft index values and the number of teeth with pulp involvement or BMI grouping, which is inconsistent with the findings of the present study.[21] In another study in German primary schools, a significant and direct relationship was reported between body mass index and the incidence of dental caries in their primary and permanent teeth, which is consistent with the present study.[22] Gerdin et al also reported a significant relationship between dental caries and Swedish children's BMI.[27]

Most of studies focused on different communities. Also, other criteria for body fat distribution such as waist circumference and waist to hip ratio have not been evaluated in this study. Obesity and overweight depend on many genetic and environmental factors.[28,29] Obviously, it is not possible to differentiate and detect the effects of these factors in a cross-sectional study such as the present study; therefore, comparison is not possible. However, it may be assumed that depending on the society, children who are highly prone to obesity and the role of environmental factors is important in their obesity, may be at risk of caries due to poor eating habits and carbohydrate intake.

Finally, without considering genetic factors, some environmental factors are associated with the occurrence of caries and it is possible to assess the risk of caries with the help of these factors; But more articles and research are needed in this area.

Conclusion

It can be concluded:

1. Some environmental risk factors such as economic status, mother's job and child's weight are associated with caries risk.

2. The DMFT index increases with increasing caries risk, so by being low risk, this index has a lower number than the medium and high risk.

3. BMI is directly and significantly related to the risk of caries.

Conflict of Interest: Authors have declared that no competing interests exist.

Ethical Clearance: Ethical clearance taken from ethical committee of Ahvaz Jundishapur University of Medical Sciences.

Funding: None

References

1. Newbrun E. Preventing dental caries: current and prospective strategies. Journal of the American Dental Association (1939). 1992;123(5):68-73.
2. Mandel ID. Caries prevention: current strategies, new directions. The Journal of the American Dental Association. 1996;127(10):1477-88.
3. Edelstein BL. Case planning and management according to caries risk assessment. Dental Clinics of North America. 1995;39(4):721-36.
4. Dodds MW, Suddick RP. Caries risk assessment for determination of focus and intensity of prevention in a dental school clinic. Journal of dental education. 1995;59(10):945-56.
5. Dean JA. McDonald and Avery's Dentistry for the Child and Adolescent-E-Book: Elsevier Health Sciences; 2015.
6. Clarke M, Locker D, Berall G, Pencharz P, Kenny DJ, Judd P. Malnourishment in a population of young children with severe early childhood caries. Pediatric dentistry. 2006;28(3):254-9.
7. Cogulu D, Ersin NK, Uzel A, Eronat N, Aksit S. A long-term effect of caries-related factors in initially caries-free children. International Journal of Paediatric Dentistry. 2008;18(5):361-7.
8. Davies GN. Early childhood caries—a synopsis. Community Dentistry and Oral Epidemiology. 1998;26(S1):106-16.
8. Irvine J, Holve S, Krol D, Schroth R. Early childhood caries in Indigenous communities: A joint statement with the American Academy of Pediatrics. Paediatrics & child health. 2011;16(6):351-7.
10. Moss ME, Zero D. An overview of caries risk assessment, and its potential utility. Journal of dental education. 1995;59(10):932-40.
11. Aggeryd T. Goals for oral health in the year 2000: cooperation between WHO, FDI and the national dental associations. International dental journal. 1983;33(1):55-9.

12. Axelsson P. An introduction to risk prediction and preventive dentistry: Quintessence Publishing (IL); 1999.
13. Tinanoff N. Dental caries risk assessment and prevention. Dental Clinics of North America. 1995;39(4):709.
14. Mohammadi Zeidi I, Yekaninejad M, Akaberi AThe effect of motivational interview on oral health self-care behaviors in high school students in Qazvin. Journal of North Khorasan University of Medical Sciences. 2013;5(1):127-37
15. Nowak A, Christensen JR, Mabry TR, Townsend JA, Wells MH. Pediatric Dentistry-E-Book: Infancy through Adolescence: Elsevier Health Sciences; 2018.
16. Reich E, Lussi A, Newbrun E. Caries-risk assessment. International dental journal. 1999;49(1):15-26.
17. Anaise JZ. Measurement of dental caries experience-modification of the DMFT index. Community dentistry and oral epidemiology. 1984;12(1):43-6.
18. Shirazi M. A survey of knowledge, attitude and practice of fifth grade elementary students in East Tehran about oral health in the academic year 2009-2010. Directory of PDFs. 2014.
19. Farsi N, Merdad L, Mirdad S. Caries risk assessment in preschool children in Saudi Arabia. Oral health & preventive dentistry. 2013;11(3).
20. Seyed Jalal P., Keyvan G, Azam N. Evaluation of the relationship between severe dental caries in childhood (S-ECC) and body mass index (BMI) in 2-4 year old children in kindergartens in Tehran.
21. Sheller B, Churchill SS, Williams BJ, Davidson B. Body mass index of children with severe early childhood caries. Pediatric dentistry. 2009;31(3):216-21.
22. Willerhausen B, Blettner M, Kasaj A, Hohenfellner K. Association between body mass index and dental health in 1,290 children of elementary schools in a German city. Clinical oral investigations. 2007;11(3):195-200.
23. Pinto A, Kim S, Wadenya R, Rosenberg H. Is there an association between weight and dental caries among pediatric patients in an urban dental school? A correlation study. Journal of dental education. 2007;71(11):1435-40.
24. Kopycka-Kedzierawski D, Auinger P, Billings R, Weitzman M. Caries status and overweight in 2-to 18-year-old US children: findings from national surveys. Community dentistry and oral epidemiology. 2008;36(2):157-67.
25. Kantovitz KR, Pascon FM, Rontani RM, Gavião MB. Obesity and dental caries--A systematic review. Oral Health Prev Dent. 2006;4(2):137-44.
26. Yousefi M, Behroozpour K, Kazemi Sa, Afroghi S. Prevalence and factors affecting tooth decay in children aged 7 to 12 years in Boyer-Ahmad city in 2014. Armaghan Danesh. 1394; 20 -9 (consecutive 104).
27. Gerdin EW, Angbratt M, Aronsson K, Eriksson E, Johansson I. Dental caries and body mass index by socio-economic status in Swedish children. Community dentistry and oral epidemiology. 2008; 36(5): 459-464.
28. Clément K. Genetics of human obesity. Comptes rendus biologies. 2006;329(8):608-22.
29. Wardle J. Understanding the aetiology of childhood obesity: implications for treatment. Proceedings of the Nutrition Society. 2005;64(1):73-9.