Assessment of decayed, missing, and filled teeth and the influencing factors in 7-10-year-old students in Quchan, Iran, 2020-2021

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Original Article

Abstract

BACKGROUND AND AIM: Dental caries is considered the most common chronic disease in childhood and decayed, missing, and filled teeth (DMFT) index is regarded as a valuable prognostic factor for oral and dental health in adulthood. Thus, the aim of this study was to describe the prevalence of DMFT and self-care behavior among 7-10-year-old students in Quchan, a city in northeast Iran.

METHODS: A total of 528 students aged 7-10 years old, selected through cluster random sampling, participated in this descriptive cross-sectional study. Demographic information including age, gender, parental educational level, and frequency of tooth brushing was obtained from the participants; DMFT index was recorded after careful oral examination. Data were analyzed using one-way analysis of variance (ANOVA), independent samples t-test, and chi-square test.

RESULTS: In this study, the ratio of girls to boys was 1:1. The overall mean of DMFT was 4.70 ± 3.16, with no significant difference regarding the gender. However, different age ranges presented significant fluctuation in the mean of DMFT value with the significantly highest value observed in 9-year-old and the lowest in 10-year-old students. Moreover, 8.92% of the participants were caries-free (CF), with a significant dominance of girls. The significantly higher CF index was observed in 7-year-old students as compared to the other ages. However, daily tooth brushing or parental educational level showed no significant correlation with DMFT or CF indices.

CONCLUSION: Due to the high prevalence of DMFT reported in this study, a comprehensive plan should be developed to promote children's oral health. This issue reinforces the need for preventive programs in general policies of the county.

KEYWORDS: Oral Health; Dental Hygiene; Tooth; Students

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ental caries is considered the most common chronic disease in childhood.[1] Tooth decay is affected by a variety of environmental factors such as oral bacterial flora, fluoride exposure, oral care behavior, sugar consumption, tooth morphology, socio-economic status (SES), and access to oral health care services.[2] Dental caries causes numerous complications which could adversely affect oral health-related quality of life (OHRQOL), such as suffering from pain, eating and sleeping disorders, school absence, and early tooth loss.[3] Thus, regarding the vital importance of oral hygiene and its effects on general health, World Health Organization (WHO) has emphasized the significance of oral health and reported that about 60%-90% of schoolchildren, especially in Asian countries and Latin America, suffer from dental decay worldwide.[4] Indeed, oral health is greatly influenced by a variety of key factors such as high-quality nutrition and drinking water, high level of knowledge and attitude towards the issue, and SES.[5] For example, in line with the impact of SES on most common health

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problems, dental caries are believed to be more common among lower socio-economic classes like ethnic minorities and those who live in deprived areas.[6]

In epidemiological studies regarding dental caries, decayed, missing, and filled teeth (dmft) are considered the most common oral health epidemiological indices which represent the oral health status of the population and have been accepted by authorities and international organizations such as the WHO.[7] Indeed, "DMFT" index is a simple, fast-reaching, and reliable index to determine mouth and tooth health situation in children with mixed dentition.[8] According to the WHO recommendation for lowering DMFT, it is strongly required to recognize the oral health situation of different geographical areas in order to make potential preventive efforts for oral diseases. However, based on available databases, no studies have been done up to now in this field in Quchan, Iran. Thus, in line with the priority of preventive treatments in general policies of the country[9] and the emphasis of WHO on oral and dental health due to its impact on the quality of life (QOL)[10] and given the prevalence of oral and dental diseases in Iran and the insistent need to update the current data, the present study aimed to investigate the oral health status of 7-10-year-old students in Quchan from 2020 to 2021. The results of this study could be beneficial for health planners involved in oral health education and caries prevention.

Methods

The current study was a descriptive cross-sectional one carried out during 2020-2021. Of all students of 26 elementary schools of Quchan (including 14 girls' and 12 boys' elementary schools), 528 students, aged 7-10 years old, were selected via cluster random sampling (n = 528). The sample size was determined according to Krejcie and Morgan Table.[11] The inclusion criteria were: 1. agreement to participate in the study, 2. full participation, and 3. having no physical illness. Moreover, all participants were assured that their contribution would affect their grades in no way.

Due to the difficulty in making decision on the underlying reasons for tooth loss, especially molars, in children aged 10-12 years, this age range was omitted from this study.

All participants were examined and interviewed under the supervision of two general dentists. Demographic data including age and gender were asked from the participants while parental educational level and frequency of tooth brushing, representative of basic factors influencing oral and dental health, were noted by the participants' parents using a general information form. The DMFT index was calculated by counting the number of decayed, missing, and filled deciduous teeth after careful dental examination and diagnosis as recommended by WHO.[12] Tooth decay diagnosis was made once any cavity in points and grooves, smooth surfaces, or surrounding enamel floor of teeth was examined. Teeth with a temporary or permanent filling were considered filled teeth. Lost or extracted teeth (in cases of decay) were taken as missed teeth. It is notable that tooth loss due to extraction for orthodontic treatment or following trauma was excluded in this study.

Examinations were performed while students were sitting at a dental unit under standard artificial light, using disposable mirror and dental explorer. Hypochlorite solution was used to sterilize instruments.

The statistical analysis was performed using SPSS software (version 20, IBM Corporation, Armonk, NY, USA). After descriptive analysis, data were analyzed by one-way analysis of variance (ANOVA) to evaluate any statistical differences in DMFT index in terms of age groups, parental educational level, and daily tooth brushing. Independent samples t-test was used to test the possible DMFT index relationship with gender. Chi-square test was also applied to assess any relationship between caries-free (CF) index and categorical variables

(educational level and gender). P-value under 0.05 (P < 0.05) was considered significant.

This study was performed in accordance with Institutional Review Board (IRB) of Mashhad University of Medical Sciences, Mashhad, Iran. All participants were given oral and written information about the aim of the study and were assured that any contribution would be voluntary and their personal information would remain completely confidential.

Results

A total of 528 students aged 7-10 years old participated in this study with an equal gender distribution (boys vs. girls = 1:1). The overall mean of DMFT was 4.70 ± 3.16, with no significant difference regarding the gender (P = 0.472). The mean values of DMFT in students aged 7 (38.5%), 8 (19.5%), 9 (26.8%), and 10 (15.2%) years were 4.69 ± 3.44, 4.97 ± 3.06, 5.23 ± 2.84, and 3.43 ± 2.75, respectively. No significant difference was observed in the mean value of DMFT comparing students aged 7 with those aged 8 (P = 0.476), aged 7 with those aged 9 (P = 0.123), and aged 8 with those aged 9 (P = 0.523). However, the mean of DMFT in students aged 10 showed a significant decrease as compared with all other age ranges (P = 0.001) (Table 1).

In this study, 8.92% of all students were CF, with a significant dominance of girls

(P = 0.002). Moreover, 7-year-old students showed significantly higher CF index in comparison to other ages including those aged 8 (P = 0.041), 9 (P = 0.043), and 10 years (P = 0.037). However, no significant difference in the CF index was observed while comparing students aged 8 with those aged 9 (P = 0.057), aged 8 with those aged 10 (P = 0.065), and aged 9 with those aged 10 (P = 0.067) (Table 1).

In this study, parental educational level and frequency of daily tooth brushing were evaluated to assess any probable correlation with the mean of DMFT or CF indices. Parental educational level was categorized as under diploma, diploma, bachelor's degree, and higher. Diploma was the most prevalent educational level in both parents. However, neither fathers' nor mothers' educational level showed any significant correlation with DMFT (P = 0.176 and P = 0.517, respectively) or CF (P = 0.481 and P = 0.941, respectively) indices (Table 2).

In terms of frequency of daily tooth brushing, more than half of the students (53.03%) brushed their teeth once a day, while 33.91% reported no daily tooth bushing, 12.31% brushed their teeth twice a day, and 0.61% three times a day.

However, no significant correlation was found with DMFT (P = 0.948) or CF (P = 0.382) indices regarding frequency of daily tooth brushing (Table 3).

Table 1. Distribution of decayed, missing, and filled teeth (DMFT) and caries-free (CF) indices based on demographic characteristics (age and gender)

Demographic variables	Relative frequency [n (%)]	dmft (mean)	P[#]	CF index [n (%)]	P[**]
Age (year)			0.001*		0.041*
7	200 (38.50)	4.69	Against 8: 0.476 Against 9: 0.123 Against 10: 0.001	24 (4.70)	Against 8: 0.041 Against 9: 0.043 Against 10: 0.037
8	101 (19.50)	4.97	Against 9: 0.523 Against 10: 0.001	5 (1.05)	Against 9: 0.057 Against 10: 0.065
9	140 (26.80)	5.23	Against 10: 0.001	7 (1.04)	Against 10: 0.067
10	80 (15.20)	3.43		10 (1.09)	
Gender			0.351$		0.002*
Boys	257 (50.00)	4.81		13 (2.50)	
Girls	257 (50.00)	4.61		33 (6.40)	

*P < 0.05 is considered significant, **Chi-square test; #One-way analysis of variance (ANOVA); $Independent samples t-test
DMFT: Decayed, missing, and filled teeth; CF: Caries-free

Table 2. Distribution of decayed, missing, and filled teeth (DMFT) and caries-free (CF) indices based on parental educational level

Parental educational level	Relative frequency [n (%)]	dmft (mean)	P*	CF index [n (%)]	P**
Father's educational level			0.176		0.481
Under diploma	112 (21.8)	4.83		7 (1.4)	
Diploma	303 (58.9)	4.69		32 (6.2)	
Bachelor's degree	88 (17.1)	4.64		6 (1.2)	
Higher	11 (2.1)	6.83		2 (0.2)	
Mother's educational level			0.517		0.941
Under diploma	141 (27.4)	4.82		13 (2.5)	
Diploma	320 (62.3)	4.61		29 (5.6)	
Bachelor's degree	50 (9.7)	4.68		4 (0.8)	
Higher	3 (0.6)	6.56		0 (0)	

*One-way analysis of variance (ANOVA); **Chi-square test
DMFT: Decayed, missing, and filled teeth; Caries-free Caries

Discussion

Health maintenance reinforces the need to consider all aspects of well-being including oral and dental health. A major problem in this field is dental caries whose influencing factors still remain part of a multi-dimensional puzzle to discover and focus on.[13]

The present study revealed that the mean value of DMFT in 7-10-year-old children in Quchan was 4.70 ± 3.16, with no significant difference regarding the gender. The results of this study were similar to those of the study by Ajami and Ebrahimi who claimed that the mean value of DMFT in a population of 1938 pre-school (6-year-old) children in Mashhad was 4.72 ± 4.18, with no significant difference regarding the gender.[14] Moreover, Shahrabi et al. declared that the mean of DMFT value in 12-year-old students of Tehran, Iran, was 3.07, with no significant difference considering the gender.[15] However, Bayat Movahed et al. reported that the mean of DMFT value in Iranian 9-year-old students was 3.6, representing a significant difference regarding the gender.[16]

The controversy between the two studies could be due to the difference in the sample size, as the latter was conducted on a large number of children (n = 8723).

In this study, different age ranges showed significant differences in the mean of DMFT index. While 9-year-old students showed the significantly highest mean of DMFT index, the lowest was observed among 10-year-old students. Although it is supposed that DMFT index would either remain the same or increase over time, the results of the present study might be modified by augmentation of the sample size of 10-year-old students.

The findings of the present study revealed that parental educational level had no significant correlation with DMFT or CF indices. Babaei Hatkehlouei et al. also showed that the educational level of mothers had no significant influence on the DMFT index of first-grade elementary students in Mazandaran Province, Iran.[17] However, the results of the present study contradicted with those presented by Meamar et al.[18] and Mohebi et al.,[19] who claimed that DMFT was lower in higher parental educational level.

Table 3. Distribution of decayed, missing, and filled teeth (DMFT) and caries-free (CF) indices based on frequency of daily tooth brushing

Frequency of daily tooth brushing	Relative frequency [n (%)]	dmft (mean)	P*	CF index [n (%)]	P**
			0.948		0.382
0	174 (33.91)	4.83		16 (3.10)	
1	274 (53.03)	4.67		21 (4.10)	
2	63 (12.31)	4.47		9 (1.80)	
3	3 (0.61)	4.05		0 (0)	

*One-way analysis of variance (ANOVA); **Chi-square test
DMFT: Decayed, missing, and filled teeth; CF: Caries-free

Indeed, there are few studies that have identified a significant relationship between indicators of mothers' oral health and their children's oral health status. Based on the evaluation of mothers' DMFT along with use of mouth rinse and dental floss, Lee et al. concluded that the better the oral health status of the mother, the better the oral health status of the child was.[20] This issue implies that parental behavior toward dental care may affect children' oral health status including DMFT more meaningfully.

In the present study, no significant relationship was found between DMFT and the frequency of tooth brushing as an oral self-care behavior. The findings showed that 33.91% of children did not brush their teeth daily. Fani showed that 17.5% of 11-12-year-old students living in Bavanat region, Iran, did not brush their teeth daily.[9] Toumarian et al. reported that about one-third of 12-year-old students living in Qom, Iran, did not perform daily tooth brushing.[21]

Although it is hypothesized that advanced parental educational level may result in higher awareness and upper socioeconomic background, the findings of this study indicated its insufficiency to positively affect children's oral health.[22] Indeed, the rate of caries incidence is drastically related to feeding practices, snacking habits, and pattern of dental visiting which all could significantly affect the DMFT index in children.[23]

In the current study, 8.92% of students were found CF. Toumarian et al. reported that 10.7% of 12 year-old students living in Qom were discovered CF.[21] In the present study, no statistical significance was found in DMFT value regarding gender or age. However, the results of the present study revealed that the rate of being CF was significantly higher in girls than boys. However, Ajami and Ebrahimi[14] and Nour Elahian and Afshari[24] showed no significant difference in the CF index regarding the gender. On the contrary, the present study showed that gender of participants was significantly correlated with the CF state, revealing girls to be

significantly more CF. Furthermore, the results indicated that 7-year-old students were more CF. This could be due to least time period after deciduous tooth eruption in comparison to the other ages.

Treating dental caries is costly and the disease is one of the four most expensive diseases.[1] To protect against dental caries, several personal oral hygiene instructions are recommended including proper brushing and dental flossing, dietary changes comprising sugar intake reduction, and fluoride therapy.[25,26] Indeed, the diet of individuals, SES, dental anomalies, work/life environment, and exposure to drinking water containing fluoride have been determined to have a direct effect on dental caries.[27] In order to promote the health of the community, health programs should begin in early ages and continue in adulthood.[3,28] Since poor oral health in childhood is a negative prognostic factor for oral health status in adulthood, school-based oral health programs like supervised tooth brushing, fluoride-containing products delivery, and promoting access to oral health services can improve oral health of children in mixed dentition period. Indeed, taking care of oral and dental health should start from childhood to successfully continue in adulthood.

One of the limitations of this study was that DMFT index was recorded as a whole instead of separate parts including decayed, missing, and filled teeth. Moreover, although parental educational level and frequency of daily tooth brushing hold no significant correlation with DMFT or CF indices, it is recommended to evaluate some more influential factors such as frequency of dentistry consultation and use of fluoride mouth rinsing solutions.

Conclusion

The prevalence of dental caries in deciduous dentition is an alarming sign for poor oral health in adulthood. Therefore, more attention should be paid to the oral health of elementary school-aged children. This study revealed that the mean value of DMFT in students of Quchan was higher than WHO standards;

thus, to improve the present situation, it is necessary to develop a proper plan paying more attention to dental and oral health through mass media, health service centers, and health teachers in schools.

Conflict of Interests

Authors have no conflict of interests.

References

1. Chenicheri S, R U, Ramachandran R, Thomas V, Wood A. Insight into oral biofilm: Primary, secondary and residual caries and phyto-challenged solutions. Open Dent J 2017; 11: 312-33.
2. Almerich-Torres T, Montiel-Company JM, Bellot-Arcis C, Iranzo-Cortes JE, Ortola-Siscar JC, Almerich-Silla JM. Caries prevalence evolution and risk factors among schoolchildren and adolescents from Valencia (Spain): Trends 1998-2018. Int J Environ Res Public Health 2020; 17(18).
3. Sistani MMN, Hataminia Z, Hajiahmadi M, Khodadadi E. Nine years' trend of dental caries and severe early childhood caries among 3-6-year-old children in Babol, Northern Iran. Electron Physician 2017; 9(6): 4683-8.
4. Aggeryd T. Goals for oral health in the year 2000: Cooperation between WHO, FDI and the national dental associations. Int Dent J 1983; 33(1): 55-9.
5. Campus G, Cocco F, Strohmenger L, Cagetti MG. Caries severity and socioeconomic inequalities in a nationwide setting: Data from the Italian National pathfinder in 12-years children. Sci Rep 2020; 10(1): 15622.
6. Shaffer JR, Carlson JC, Stanley BO, Feingold E, Cooper M, Vanyukov MM, et al. Effects of enamel matrix genes on dental caries are moderated by fluoride exposures. Hum Genet 2015; 134(2): 159-67.
7. Zhang T, Hong J, Yu X, Liu Q, Li A, Wu Z, et al. Association between socioeconomic status and dental caries among Chinese preschool children: A cross-sectional national study. BMJ Open 2021; 11(5): e042908.
8. Elyassi GN, Nasiri P, Malekzadeh SA, Moosazadeh M. Comparison of dental caries (DMFT and DMFS indices) between asthmatic patients and control group in Iran: A meta-analysis. Asthma Res Pract 2021; 7(1): 2.
9. Fani MM. Evaluation of DMFT index in 11-16 year- old children of Bavanat in 2001. J Dent Shiraz Univ Med Sci 2003; 4(1): 23-30. [In Persian].
10. Khalid T, Mahdi SS, Khawaja M, Allana R, Amenta F. Relationship between socioeconomic inequalities and oral hygiene indicators in private and public schools in Karachi: An observational study. Int J Environ Res Public Health 2020; 17(23): 8893.
11. Krejcie RV, Morgan DW. Determining sample size for research activities. Educ Psychol Meas 1970; 30(3): 607-10.
12. World Health Organization. Oral health surveys: Basic methods. 5th ed. Geneva, Switzerland: WHO; 2013.
13. Asl Aminabadi N, Balaei E, Pouralibaba F. The effect of 0.2% sodium fluoride mouthwash in prevention of dental caries according to the DMFT index. J Dent Res Dent Clin Dent Prospects 2007; 1(2): 71-6.
14. Ajami B, Ebrahimi M. Evaluation of oral health status amongst 6-7-year-old children in Mashhad in 2001. J Mashad Dent Sch 2005; 29(3-4): 235-42. [In Persian].
15. Shahrabi M, Mohandes F, Seraj B. Assessing DMFT index in 12 years old students attending hearing impaired schools in Tehran. J Dent Med Tehran Univ Med Sci 2007; 19(4): 102-6. [In Persian].
16. Bayat Movahed S, Samadzadeh H, Ziyarati L, Memary N, Khosravi R, Sadr-Eshkevari P. Oral health of Iranian children in 2004: A national pathfinder survey of dental caries and treatment needs. East Mediterr Health J 2011; 17(3): 243-9.
17. Babaei Hatkehlouei M, Tari H, Goudarzian AH, Hali H. Decayed, missing, and filled teeth (DMFT) index among first-grade elementary students in Mazandaran Province, Northern Iran. Int J Pediatr 2017; 5(6): 5069-77.
18. Meamar N, Ghazizadeh A, Mahmoodi S. DMFT (decayed, missing and filled teeth) index and related factors in 12- year- old school children in Sanandaj. Sci J Kurdistan Univ Med Sci 2000; 5(1): 30-6. [In Persian].
19. Mohebi S, Ramezani A, Matlabi M, Mohammadpour L, Noor NS, Hosseini ES. The survey of oral-dental health of grade 3 students of Gonabad primary schools in 2007. Horizon Med Sci 2009; 14(4): 69-76. [In Persian].
20. Lee SM, Kim HN, Lee JH, Kim JB. Association between maternal and child oral health and dental caries in Korea. J Public Health (Berl) 2019; 27(2): 219-27.
21. Toumarian L, Souri S, Farhadi H. DMFT index study of 12 year-old students living in Qom City. J Dent Sch Shahid Beheshti Univ Med Sci 2005; 23(3): 467-74. [In Persian].
22. Mashoto KO. Dental caries, oral-health-related quality of life and atraumatic restorative treatment (ART): A study of adolescents in Kilwa district of Tanzania. Bergen, Norwey: The University of Bergen; 2011.

23. Rajab LD, Hamdan MA. Early childhood caries and risk factors in Jordan. Community Dent Health 2002; 19(4): 224-9.
24. Nour Elahian H, Afshari AG. Study of the DMFT index of first permanent molars in 12 year old students in Zahedan, 2000-2001. J Dent Sch Shahid Beheshti Univ Med Sci 2003; 21(4): 591-7. [In Persian].
25. Bandyopadhyay D, Reich BJ, Slate EH. A spatial beta-binomial model for clustered count data on dental caries. Stat Methods Med Res 2011; 20(2): 85-102.
26. Shanthi M, Reddy BV, Venkataramana V, Gowrisankar S, Reddy BV, Chennupati S. Relationship between drinking water fluoride levels, dental fluorosis, dental caries and associated risk factors in 9-12 years old school children of Nelakondapally Mandal of Khammam District, Andhra Pradesh, India: A cross-sectional survey. J Int Oral Health 2014; 6(3): 106-10.
27. Harrison R. Oral health promotion for high-risk children: Case studies from British Columbia. J Can Dent Assoc 2003; 69(5): 292-6.
28. Currie C, Roberts C, Settertobulte W, Morgan A, Smith R, Samdal O, et al. Young people's health in context: Health Behaviour in School-aged Children (HBSC). Copenhagen, Denmark: World Health Organization, Regional Office for Europe; 2004.