Dental caries prevalence among intermediate and secondary school students in Thamar–Yemen

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ABSTRACT.

Aims: To determine the prevalence of dental caries among intermediate and secondary school students 13–16 years old to determine the age and sex difference and to obtain data that can help in planning preventive dental health programs for school students in Yemen. **Materials and Methods:** A random sample of 512 intermediate school students,449 secondary school students were examined. Intermediate school student sample was divided into 3 age groups namely 13,14,15 and secondary school student sample was divided into 3 age groups namely 16,17,18 years old. The WHO methodology (1997) was used to assess the individual tooth status. **Results:** The mean DMFT for the total sample was 5.2±0.13; which increased with the increasing of age from 4.54 to 4.84 to 6.47 for the age groups 13,14,15 years old respectively; without significant sex difference as total 5.44 for males and 5.14 for total females. Results of dental caries for the secondary school students showed that the mean DMFT for the total sample was 5.98± 0.14, which decreased with the increasing of age from 5.60 to 6.49 to 5.85 for the age groups 16,17,18 years old respectively, with peak value at 17 years old without significant sex difference, 5.74 for total males, 6.21 for total females. **Conclusion:** The mean DMFT for both intermediate, secondary schools increased with increasing age with statistical significant difference with no sex differences.
Key Words: Dental caries, tooth status, intermediate, secondary school students.

INTRODUCTION

Dental caries is a highly prevalent chronic sugar dependent infectious disease, affecting calcified tissue of the tooth and causing demineralization of the inorganic portion with subsequent destruction of the organic substance. The carious tooth never returns to its original state, even if it is treated.[1]

Three factors (the epidemiological triad) play a role in the development of dental caries: the host (genetic predisposition, malnutrition during teeth formation and behaviour, such as dietary habits and oral hygiene practices); the agent (mainly streptococcus mutans); and finally the environment (lack of fluoride in water, lack of vitamin D and high consumption of refined sugars)[2–4]. These factors interact to produce a variety of dental diseases at varying rates and intensities. The factors contributing to these variations could be cultural, genetic, geographic and/or environmental in nature. Caries can be controlled by different measures, but it can

never be truly prevented[5] . Dental caries has a worldwide distribution, regardless of sex, age, race and socioeconomic level[6] .

In many Arab countries, dental caries is increasing overtime, especially since the relatively recent economic growth, which has resulted in an increased consumption of refined sugar [7–11] higher than in other developing countries[10] . Lack of awareness about oral health practices has also contributed to the increase in dental caries. In Morocco, Sudan, Jordan and Lebanon, for example, the decayed, missing, filled teeth indices (DMFT) were 2.6,1.1,0.2 and 3.6 respectively in the 1970s and increased to 4.5, 2.1,1.7 and 5.0 respectively in the 1980s and 1990s (WHO unpublished data 1974, 1979,1984)[12,13]. However, there is no study conducted on Yemen Republic concerning prevalence of dental caries except the present study concerning prevalence of dental caries among primary school children in Thamar which revealed a mean dmft for the primary dentition was 3.40±0.15. It was decreased with increas-

ing age with significant sex difference (males was higher than females, while for the permanent dentition the mean DMFT was 3.35±0.12, which increased with increasing the age which statistically significant age difference, but with no sex variation. [14]

The aims of this study were to determine the prevalence of dental caries in intermediate and secondary school students in Thamar Governorate. To determine age and sex differences in the prevalence of dental caries. To obtain data that can help in the planning preventive dental health programs for school children in republic of Yemen.

MATERIALS AND METHODS

The sample composed of 512 intermediate school children age 13,14,15 years old randomly selected from four intermediate schools in Thamar province 2 schools for boys, 2 schools for girls (total males 252, total females 260) divided into 3 age groups 13,14,15 years old.While the sample of secondary schools composed of 449 secondary school students age 16,17,18 years old randomly selected from four secondary schools in Thamar province, 2 schools for boys, 2 schools for girls (total males 218, total females 231) divided into 3 age groups 16,17,18 years old.

Oral Examination:

Examination of teeth was performed according to the basic method of oral health survey of WHO for the year 1997 assessing tooth status, DMFT index was used [15].

The examination was carried out using plane mouth mirrors and sharp sickle shaped dental caries explorers. The examination was performed in classrooms. Students chosen randomly from the list were examined under natural day light. All teeth present in the mouth were examined in a systematic approach starting from the last upper right molar proceeding in an orderly manner from one tooth or tooth space till the last lower right molar. Information regarding name, age, sex of the child was registered on a special case sheet prior to the examination.

The data were analyzed using SAS program. The complete randomized design (CRD) were used for analysis of variance of data. Means were tested for their significant differences by using Duncan's Multiple Range Test at 0.05 level for 13, 14 and 15 years, and for 16, 17 and 18 years old school students.

RESULTS

Table (1) shows the distribution of the sample by age and sex. The sample of intermediate school students compose of 512 student. 252 males (49.21%), 260 females (50.78%) divided into 3 age groups 13,14,15 years old.
Age 13 constitutes (32.8%) of the total sample.
Age 14 constitutes (33.6%) of the total sample.
Age 15 constitutes (33.6%) of the total sample.
The total forms 99.9%.

Table (2) shows the distribution of the sample by age and sex. The sample of secondary school students composed of 449 student, 218 males (48.55%), 231 females (51.44%) divided into 3 age groups were distributed according to age and sex as it was shown in Table (2):
Age 16 constitutes (35%) of the total sample.
Age 17 constitutes (33.9%) of the total sample.
Age 18 constitutes (31.2%) of the total sample.
The total forms 100%.

Table (1): Distribution of the sample by age and sex for intermediate school students

Age (years)	Male		Female		Total	
	No.	%	No.	%	No.	%
13	84	33.33	84	32.3	168	32.8
14	84	33.33	88	33.8	172	33.6
15	84	33.33	88	33.8	172	33.6
Total	252	99.99	260	99.9	512	100

Table (2): Distribution of the sample by age and sex for secondary school students

Age (years)	Male No.	Male %	Female No.	Female %	Total No.	Total %
16	77	35.3	80	34.6	157	35.0
17	72	33.0	80	34.6	152	33.9
18	69	31.7	71	30.7	140	31.1
Total	218	100	231	99.9	449	100

Table (3): Mean DMFT and its components ± SE by age and sex for intermediate school students

Age	Sex	DMFT mean	DMFT S.E.	DT mean	DT S.E.	MT mean	MT S.E.	FT mean	FT S.E.
13	Male	4.30c	0.36	4.27b	0.36	2.00a	0.58	2.50a	0.29
	Female	4.69c	0.26	4.57b	0.25	1.33a	0.21	1.00a	0.00
	Total	4.54B	0.22	4.42B	0.22	1.60A	0.27	2.00A	0.37
14	Male	4.98c	0.31	4.85b	0.30	1.67a	0.14	−	0.58
	Female	4.70c	0.29	4.63b	0.29	1.33a	0.21	2.00a	0.31
	Total	4.84B	0.21	4.74B	0.21	1.56A	0.12	2.00A	0.58
15	Male	6.95a	0.45	6.48a	0.42	2.20a	0.30	1.89a	0.00
	Female	6.00b	0.28	5.96a	0.28	1.00a	0.00	1.00a	0.21
	Total	6.47A	0.27	6.20A	0.25	2.09A	0.29	1.80A	0.29
Total males		5.44(a)	0.23	5.19(a)	0.22	2.00(a)	0.19	2.00(a)	0.26
Total females		5.14(a)	0.16	5.06(a)	0.16	1.29(b)	0.13	1.50(a)	0.33
Total sample		5.2	0.13	5.12	0.13	1.8	0.14	1.86	0.21

Means with the same letters are statistically not different ($p \geq 0.05$); SE: Standard error; Capital letters compare between total males and females (age); Small letters between brackets compare between total females and males (sex); Small letters without brackets compare between males and females within the same age group.

Table (3) shows the mean DMFT for the total sample of intermediate school students.

The mean DMFT and standard error for the total sample were found to be 5.2 ± 0.13, mean DT= 5.12 ± 0.13, mean MT= 1.8 ± 0.14 and mean FT= 1.86 ± 0.21. Ratios of the components to DMFT were found to be DT/DMFT= 98.46%, MT/DMFT= 0.34%, FT/DMFT= 0.36%. So the highest percentage is for the decayed teeth followed by filled teeth. The mean DMFT appears to be increasing from 4.54 at 13 years old to 4.84 at the 14 years to 6.47 at the age 15 years old with statistically significant difference between them.

The mean DMFT for females in the total sample was 5.14, which is slightly lower than for males (5.44). This sex difference was found to be statistically not significant.

The mean MT for total males was 2.0 which is slightly higher than that of females (1.29) with statistically significant difference between them.

While the mean DMFT for secondary school students and its components were shown in Table (4).

Table (4): Mean DMFT and its components ± SE by age and sex for secondary school students

Age	Sex	DMFT		DT		MT		FT	
		mean	S.E.	mean	S.E.	mean	S.E.	mean	S.E.
16	Male	5.82ab	0.31	5.74ab	0.32	1.63a	0.32	2.00a	0.37
	Female	5.39b	0.31	5.27bc	0.31	1.40a	0.40	1.33a	0.21
	Total	5.60B	0.22	5.50B	0.22	1.54A	0.24	1.67B	0.22
17	Male	6.50a	0.40	6.31a	0.40	1.50a	0.26	1.67a	0.21
	Female	6.49a	0.30	6.41a	0.29	1.29a	0.18	1.50a	0.29
	Total	6.49A	0.25	6.36A	0.24	1.42A	0.10	1.60B	0.16
18	Male	4.86b	0.36	4.71c	0.37	1.33a	0.21	2.33a	0.66
	Female	6.82a	0.35	6.16ab	0.32	2.00a	0.44	4.07a	0.82
	Total	5.85AB	0.26	5.43B	0.25	1.69A	0.26	3.77A	0.70
Total males		5.74(a)	0.21	5.60(a)	0.21	1.50(a)	0.16	1.93(a)	0.21
Total females		6.21(a)	0.19	5.93(a)	0.18	1.58(a)	0.21	2.96(a)	0.55
Total sample		5.98	0.14	5.77	0.13	1.53	0.12	2.56	0.35

Means with the same letters are statistically not different ($p \geq 0.05$); SE: standard error Capital letters compare between total males and females (age).Small letters between brackets compare between total females and males (sex). Small letters without brackets compare between males and females within the same age group.

The mean DMFT for the total sample and its standard error were found to be 5.98 + 0.14, mean DT= 5.77 + 0.13, mean MT= 1.53 + 0.12 and mean FT= 2.26 + 0.35. Ratios of the components to the DMFT were found to be DT/DMFT= 96.48%, MT/DMFT= 0.25%, FT/DMFT= 0.6%. The highest proportion was for the decayed teeth. The mean DMFT appears to be increasing for the first two ages with statistically significant difference between them.The mean DMFT for females in the total sample was 6.21 which is higher than that for total males (5.74) but with no statistical significant difference between them.

DISCUSSION

The present study shows that the mean DMFT for intermediate school students for the total sample was 5.2 (4.54 at the age of 13 years, 4.84 at the age of 14 years, and 6.47 at the age of 15 years). The caries prevalence and severity among permanent dentition of this age group is increasing with advancing age. No significant difference was found between 13 and 14 years old, but significant difference was found between the ages 14 and 15 years old. This is attributed to the irreversibility of the caries process and accumulative nature of the disease. This finding is in agreement with many studies in the developed countries (16–19) and in developing countries [19–23].

The results reveled no statistical significant difference found between total males and females. This is in accordance with studies conducted in developed and developing countries [24–26]. The result of the mean DMFT at 13 years old was 4.54, according to WHO DMFT range at 12 years of 1995(27). This DMFT is considered a high level (4.5–6.5), which is higher than many developed countries like Austria (4.2), Canada (3.7), Italy (2.9), Japan (3.6) and Russian Federation (3.5) and some developing countries like India (3.8) and Madagascar [27]. The result is higher than most of the Arab countries level except Lebanon, which is the highest for this age group (DMFT=5)[27].

According to WHO DMFT range at 12 years old for Yemen in 1987–1990 [27] which was (1.6–3.1) is considered low moderate) this range is much higher than that due to accumulative nature of the disease, lack of dental awareness and resources.

Among the studies carried out in Iraq the result of this study is higher than that of Khamrco and Al–Salman[28] in Mosul City Centre which revealed the mean DMFT for 10–14 years old was 3.75, also this mean is higher than that reported by

Salman [29] among primary school children in Mosul City Centre which revealed the mean DMFT for 12 years was 2.84.

The differences in the two studies with this one may be due to the increasing age of the student and the accumulative nature of the disease which leas to increase in DMFT with increasing age.

Results of this study showed that the ratios of the components to the DMFT for the total sample of the intermediate school students were as follows:

DT/DMFT=98.46%,
MT/DMFT=0.34%, FT/DMFT= 0.35%. the highest proportion was for the decayed teeth. This may indicate that therapeutic dental services are limited due to inadequacy and lack of awareness.

The ratios of the components to the DMFT are nearly the same with that recorded by Salman[14] for primary school children indicating very little increase in the prevalence for the intermediate school students.

The mean DMFT for secondary school students for the total sample was 5.98 (5.60 at the ages 16 years, 6.49 at the ages 17 years and 5.85 at the ages 18 years. The caries prevalence and severity among this age group is increasing with advancing age. Significant difference was found between 16 and 17 years old but not significant difference was found between 17 and 18 years old. This is attributed to the irreversibility of caries process and accumulative nature of the disease. This finding is in agreement with many studies in the developed countries [21,24,30] and in developing countries [5,10,20,23,31] .

The results revealed no statistical significant difference was found between total males and females. This is in accordance with many studies conducted in developed and developing countries [20,24,30].

The result of the mean DMFT at 18 years old was 5.85, accordance to WHO DMFT range at 18 years of 1995(27) , this DMFT is considered a high level, which is more than that repeated for many developed countries like Austria (4.2), Canada (3.7), Italy (2.9), Japan (3.6) an Russian Federation (3.5) and some developing countries like India (3.8) and Madagascar (27). This result is higher than most of the Arab countries, and it is nearly the same as Lebanon (DMFT=5)(27) .

Results of this study showed that ratios of the components to the DMFT were as follows:

DT/DMFT=96.48%,
MT/DMFT=0.25%, FT/DMFT= 0.42%, the highest proportion was for the decayed teeth this may indicate that therapeutic dental services are limited due to inadequacy i.e. the need for services is far greater than the demand. The percentage of population seeking treatment on demand varied between (3–6%)(32);in Yemen. The main concern of the existing services is to satisfy the curative demands.This does not comply with the philosophy of a prevalence approach which concentrates on the primordial prevention including dental health education tooth brushing and the use of fluoridated dentifrice to achieve improvement in oral health.

CONCLUSION

The mean DMFT for the total sample for intermediate, secondary school students was 5.2, 5.98 respectively which increased with increasing age with statistical significant difference.The highest ratios of the components to the DMFT was for the decayed teeth followed by filled teeth then missing teeth. No significant sex differences between total females and total males were present concerning intermediate and secondary school students.

REFERENCES

1. Pakshir HR. Dental reduction and dentistry system in Iran. *Med Princ Pract* 2003; 12 (Suppl): 56–60.
2. Pakshir HR. Oral health in Iran. *Int Dent J*. 2004; 54(6): 367–372.
3. Paul TR. Dental health status and caries pattern of preschool children in Al–Kharj, Saudi Arabia. *Saudi Med J*. 2003; 24(12): 1347–1351.
4. Sayegh A, Dini EL, Holt RD, Bedir LM. Caries in preschool children in Amman, Jordan and the relationship to socio–demographic factors. *Int Dent J*. 2002; 52: 87–93.
5. Wyne AH. The bilateral occurrence of dental caries among 12–13 an 15–19 years old school children. *J contemp Dent Pract* 2004; 5: 42–52.

6. Pitts NB, Deery C, Fyffe HE, Nugent ZJ. Caries prevalence surveys a multi–country comparison of caries diagnostic criteria. *Community Dent Health* 2000; 17: 196.

7. AL–Shammery AR. Caries experience of urban and rural children in Saudi Arabia. *J public Health Dent* 1999; 59: 60–64.

8. Barmes DE. A global view of oral diseases: today and tomorrow. *Community Dent Oral Epidemiol* 1999; 27: 2–7.

9. Sheiham A. Dental caries in underdeveloped countries. *Int Epidemiol*. 1984; 13: 142–147.

10. Ismail AL, Tanzer JM, Dingle JL. Current trends of sugar consumption in developing societies. *Community Dent Oral Epidemiol* 1997; 25: 438–443.

11. Woodward M, Walker ARP. Sugar consumption and Dental Caries: evidence from 90 countries. *Br Dent J*. 1994; 176: 297–302.

12. World health organization. Preventive methods an programmes for oral diseases. Geneva; 1984, (WHO Technical Report series, No. 713).

13. Tamari JW. An assessment of oral disease among primary school children in Lebanon. Assessment of dental caries. *Int D J*. 1974; 24: 407–415.

14. Salman F. Prevalence of dental caries among primary school children in Thamar governorate in republic of Yemen. Accepted for publication in *AL–Rafidain D. J* 2006.

15. World Health Organization. Oral health surveys: basic Methods. 4th ed. World Health Organization, Geneva, Switzerland 1997.

16. Cahen PM, Grange D, Obry– Musset AM, Frank RM. Caries prevalence in 6 to 15 years old French children based on the 1987 and 1991 national surveys. *Int Dent Res* 1993, 72(12): 1581–1587.

17. Cahen PM, Turlot JC, Frank RM, Obry– Musset AM. National survey of caries prevalence in 6–15 years old children in France. *J Dent Res* 1989; 68(1): 64–68.

18. Fyffe HE, Deery H, Nugent ZJ, Nuttall NM, Pitts NB. Effect of diagnostic threshold on the validity and reliability of epidemiological caries diagnosis using the Dundee selectable threshold method

for caries diagnosis (DSTM). *Comm. Dent Oral Epidemiol* 2000; 28: 4251.

19. Backer–Dirks O. Longitudinal dental caries study in children 9–15 years of age. *Caries Res*. 1978; 12(suppl 1): 214.

20. Meyer Leuckel H, Satzinge R, Kielbassa AM. Caries prevalence among 6–16 years old students in Jamaica 12 years after the introduction of salt fluoridation. Caries Res 2002; 36: 170–173.

21. Ettinger RL. Epidemiology of dental caries. *Dent Clin North Am* 1999; 43: 679–694.

22. Jaberi Ansari Z. A review on the rate of caries experience in Iran during 1990–1992. *Beheshiti Univ J* 1998; 17: 246–254.

23. Miura H, Araki Y, Yaraguchi K, Arai Y, U Menai T. Socio economic factors and dental caries in developing countries: across–national study. *Soc Sci Med* 1997; 44: 296–272.

24. Marthaler TM. The prevalence of dental caries in Europe, update 1990–1995. *Caries Res* 1996; 30: 237–255.

25. Deery CH, Care R, Chesters R, Huntingtoin E, Stelmachonaka S, Gudkina. Prevalence of dental caries in Lativian 1–15 years old children and the enhanced diagnostic yield of temporary tooth separation, foti and electronic caries measurement. *Caries Res* 2000; 34: 27.

26. Alonge OK, Narendran S. Dental caries experience among school children in St. Vincent and the Grenadines: Report of the first national oral health survey. *Commu Dent Health* 1999; 16: 45–49.

27. World Health Organization. Report on the consultation on development of oral health human resources and training needs in EMR countries. WHO regional office for the Eastern Mediterranean. Alexanria, Egypt, 1995.

28. Khamarco TY, AL–Salman KhA. Dental health status among 4th–8th school children in the centre of Mosul. *Iraqi Dent J* 1998; 23: 77–88.

29. Salman F. prevalence of dental caries among school children aged 6–12 years old in Mosul city centre/ Nineveh, Iraq. MSc. Thesis. College of Dentistry, University of Mosul 1998.

30. Pitts NB, Evans DJ, Pine CM. British association for the study of Community Dentistry diagnostic criteria for caries

prevalence surveys 1996/1997. *Comm. Dent Health* 1997; 14: 6–9.

31. AL–Hosani E, Rugg–Gunn A. Combination of low parental educational attainment and high parental income related to high caries experience in preschool children in Abu–Dhabi. *Commun Dent Oral Epiemiol* 1998; 26: 31–36.

32. Arab Dental Journal. The regional meeting on strengthening of oral health in primary health care school/ oral health. 1993; Nicosia, Cyprus 1–5 November, 6(1): 44.