

## Prevalence of Caries with its Distribution by Age & Gender in Institutional Clinical Patients

Abdullah Al Mahmud <sup>\*1</sup>, Ishrat Jhahan Shathi<sup>2</sup>, Md. Atiqul Islam Rabby<sup>3</sup>, Iffat Ara Ferdoushi<sup>4</sup>, Umme Kulsum<sup>5</sup>

### Abstract

**Introduction:** Consequence of dental caries is loose of healthy tooth structure which impacts negatively on aesthetics, function, self-esteem and quality of life of the patients. Different age groups and populations exhibit distinct caries prevalence rates, observations of which could provide a useful descriptive measure of caries susceptibility in tooth surfaces. **Materials and Methods:** In this study, patients attending the Department of Conservative Dentistry & Endodontics of Dhaka Dental College & Hospital, located in Mirpur-14 and Department of Conservative Dentistry & Endodontics of Sapporo Dental College & Hospital, located in Abdullahpur (North Dhaka City), Bangladesh, were examined between 2017 and 2019. The location of dental caries on the teeth surfaces was recorded as following surface: Occlusal, Mesio-occlusal, Disto-occlusal, Proximal and Cervical for statistical evaluation and comparison. Furthermore, the age and gender of the patients were recorded on the chart for each caries tooth. **Results:** Female had higher incidence 86 (57%) of caries than males 64 (43%). Caries distribution was common in the maxillary jaw (53.38%) than in the mandibular jaw (46.62%). Among our study patient occlusal surface caries was most commonly observed (43.4%). Then, the proximal surface caries was seen in 28.3% cases. Overall 71.7% prevalence of caries was in occlusal and proximal area. Where, prevalence of proximal and cervical surface caries was higher in maxillary tooth (18.9% and 4.82%) than mandibular tooth (9.3% and 2.6%) respectively. **Conclusion:** Female are more prevalent to dental caries than male. Occlusal surface caries is most commonly observed, then, the proximal surface caries are commonly seen. Occlusal surface caries is more common in mandibular tooth than maxillary. Where, proximal and cervical surface caries was higher in maxillary tooth.

**Keywords:** Dental Caries, Prevalence & Distribution, Age & Gender.

Number of Tables: 2; Number of Figures: 4; Number of References: 29; Number of Correspondences: 5.

### \*1. Corresponding Author:

**Dr. Abdullah Al Mahmud**

BDS, FCPS

Assistant Professor

Department of Conservative Dentistry & Endodontics

Sapporo Dental College & Hospital

Dhaka, Bangladesh.

E-mail: shawonmahmud0212@gmail.com

Mobile: +8801612-207793

### 2. Dr. Ishrat Jhahan Shathi

BDS, MS

Assistant Professor

Department of Conservative Dentistry & Endodontics

Dental Unit, Sir Salimullah Medical College

Dhaka, Bangladesh.

### 3. Dr. Md. Atiqul Islam Rabby

Lecturer

Dept. of Conservative Dentistry & Endodontics

Marks Medical College & Dental Unit

Dhaka, Bangladesh.

### 4. Dr. Iffat Ara Ferdoushi

BDS

Lecturer

Department of Paediatric Dentistry

Update Dental College & Hospital

Dhaka, Bangladesh.

### 5. Prof. Dr. Umme Kulsum

BDS, DDS, MS

Professor & Head (Ex)

Department of Conservative Dentistry & Endodontics

Dhaka Dental College & Hospital

Dhaka, Bangladesh.

### Introduction:

Among all oral disease dental caries is one of the common diseases which cause pain and infection and hamper work productivity in adults<sup>1,2</sup>. Consequence of dental caries is loose of healthy tooth structure which impacts negatively on aesthetics, function, self-esteem and quality of life of the patients<sup>3</sup>. From 1990 to 2010 around 2.4 billion people were affected by dental caries which causes a huge global burden of oral health, and majority of the cases were untreated. This induced a major biological, financial and social burden on individuals,

health systems and societies. It also reported that the trend of caries is shifting from children to adults with around the age of 70, due to the appearance of root caries<sup>4</sup>. Individual tooth surfaces have vastly different susceptibilities to caries, with the pit and fissure (occlusal) surfaces the most susceptible, and the smooth (labial and lingual) surfaces the least susceptible<sup>5-6</sup>. The most frequent sites of attack are the occlusal surfaces of the first and second permanent molars<sup>4</sup>. In addition, it was reported that neighboring approximal tooth surfaces differ in their caries susceptibility,<sup>7-8</sup> implying that one surface may show obvious radiographic signs of caries, while the neighboring surface does not<sup>9</sup>. With rising life expectancy, people maintain their teeth for longer,<sup>10</sup> it is likely to observe a further increase in untreated caries in this rising population. Ageing, multimorbidity and polypharmacy may enhance caries possibility in the senior adults<sup>11</sup>. Patient's chronic medical conditions, occupational disability and cognitive impairment make dental treatment highly challenging, and unavoidably increase the burden in our health care system<sup>11</sup>. Different age groups and populations exhibit distinct caries prevalence rates, observations of which could provide a useful descriptive measure of caries susceptibility in tooth surfaces<sup>6</sup>. Older adults have considerably more factors that place tooth surfaces at risk for caries than do younger adults, due to the many health conditions faced by this population during the later phases of life, which can last as long as 40 years. During that period, the elderly face a wide spectrum of oral and general health problems<sup>12</sup>. Caries is a preventable disease and different preventive measures are available<sup>13</sup>. In the forecasting prevention programme, clear understanding of the current global caries burden is essential. The World Health Organization (WHO) recommends that clinical oral health surveys should be conducted every five to six years within the same community to provide effective surveillance on disease patterns and trends, but sorry to know that it's not practicing in our Bangladesh<sup>14</sup>. The stakeholders can hence make policies and develop programmes to prevent and control the disease. However, the most recent systematic review of caries status in global population was conducted more than a decade ago, and so far there have been none conducted in older adults<sup>4</sup>. Updated information on caries prevention and control in adults to facilitate policy planning for the coming decade is needed. The aim of this study is to explore updated information of caries status of adult population in north Dhaka City. This paper also compared these results among various gender and age groups.

#### Materials & Methods:

In this study, patients who were attending the Department of Conservative Dentistry & Endodontics of Dhaka Dental College & Hospital, located in Mirpur-14 and Department of Conservative Dentistry & Endodontics of Sapporo Dental College & Hospital, located in Abdullahpur (North Dhaka City), Bangladesh, were examined between 2017 and 2019. According to the department's patient treatment protocol, the patients were first examined in the Department of Dental

Diagnosis. Then, according to their diagnoses, patients were referred to related department for the treatment. After the second examination, the conservative treatment (e.g., caries treatment, restoration replacement, sensitivity treatment, prophylaxis, etc.) to be applied was determined by the assigned Dental Surgeons. Without drying the teeth, examinations were performed with dental mirrors and blunt sickle-shaped explorers under a dental chair light, according to WHO recommendations<sup>15</sup>. The examiner applied standardized and routinely used WHO diagnostic criteria. Firstly, caries teeth were identified, and a diagnosis of caries was made only when there was clear evidence of loss of tooth substance. White or brown spots in enamel, the surfaces of which remained intact and glossy, were not considered to be caries. Caries were recorded as present when a lesion in a pit or on a smooth tooth surface had a detectably softened floor, undermined enamel or softened wall. "Sticky" and discolored fissures were accepted as caries only if there was clear evidence of cavitation beginning below the fissure. On proximal surfaces, caries were recorded when the explorer had entered a lesion<sup>15,16</sup>. Then, the borders of caries were drawn on the related tooth figure chart. In total, 32 master charts were prepared for both side upper and lower jaws teeth. Each charts included five figures: Occlusal, mesio-occlusal, disto-occlusal, proximal and cervical surfaces. Furthermore, the age and gender of the patients were recorded on the chart for each caries tooth. The location of dental caries on the teeth surfaces was recorded as follows: 1, Occlusal; 2, Mesio-occlusal; 3, Disto-occlusal; 4, Proximal; and 5, Cervical for statistical evaluation and comparison. If lesions were involved on more than one surface, each affected surface was recorded separately. In addition, the recorded ages on the chart for each caries tooth were coded in six groups: 1, 25 years of age; 2, 25-34 years of age; 3, 35-44 years of age; 4, 45-54 years of age; 5, 55-64 years of age; and 6, above > 64 years of age.

Differences in caries incidence between surfaces of individual teeth were assessed for statistical significance using the Friedman test and Dunn's Multiple Comparisons test (if  $P < .05$ ). The Pearson Chi-Square test and Fisher's Exact Test were used to compare differences in caries prevalence of individual tooth surfaces between females and males. We also used the Mann-Whitney U test in order to compare differences in caries rates of individual tooth surfaces between age groups.

#### Result:

In this study, among 150 patients total 311 caries surfaces were recorded. Figure 1 shows that women had higher incidence 86 (57%) of caries than males 64 (43%) ( $P = 0.5$ ). Figure 2 shows the distribution of caries according to age group. The prevalence of caries experience was highest (26.7%) among individuals of 25-34 years age group. At overall 77 (51.33%) of patients were under 34 years of age, and 73 (48.67%) patients were above 35 years of age. Caries distribution was higher in the maxillary jaw (53.38%) than in the mandibular jaw (46.62%) (figure 3) ( $P < 0.5$ ).

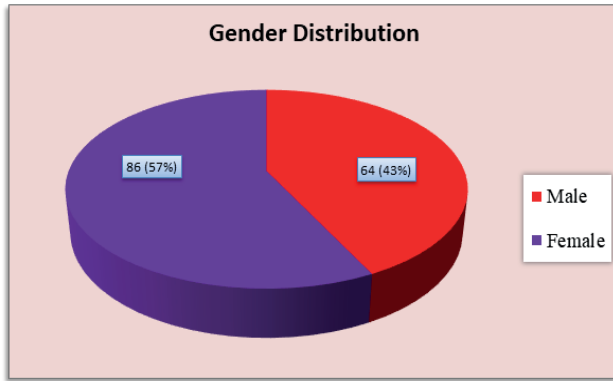


Figure 1: Percentage distribution of gender.

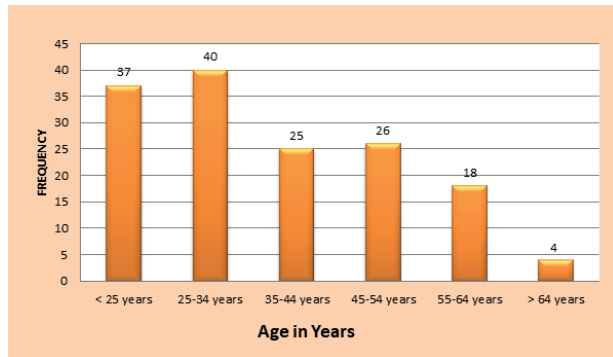


Figure 2: Frequency distribution of age.

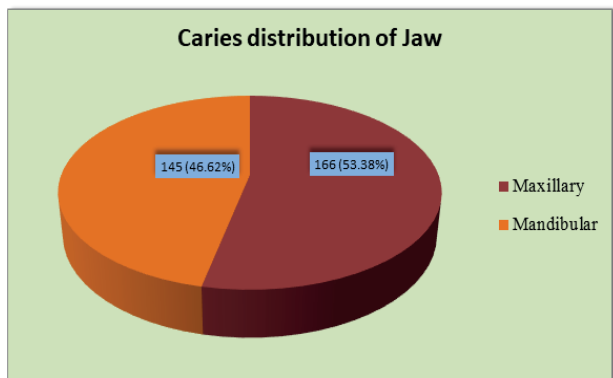


Figure 3: Percentage distribution of caries according to jaw.

Table 1 shows the distribution of caries according to tooth surfaces in female and male patients. When analyzing data aggregated by gender, occlusal, mesio-occlusal and disto-occlusal surfaces sites in women demonstrated significantly higher rates of caries than men ( $P < 0.5$ ). Where, proximal and cervical surface caries is significantly higher in male ( $P < 0.5$ ).

Table I: Number of caries surfaces (percentage in total caries) according to gender.

Gender	Occlusal	Mesio-occlusal	Disto-occlusal	Proximal	Cervical
Male	50 (16.1%)	15 (4.8%)	10 (3.2%)	47 (15.1%)	12 (3.9%)
Female	85 (27.3%)	21 (6.8%)	19 (6.1%)	41 (13.2%)	11 (3.5%)

Among our study patient occlusal surface caries was most commonly observed (43.4%). Then, the proximal surface caries was seen in 28.3% cases. Overall 71.7% prevalence of caries was in occlusal and proximal area (figure 4).

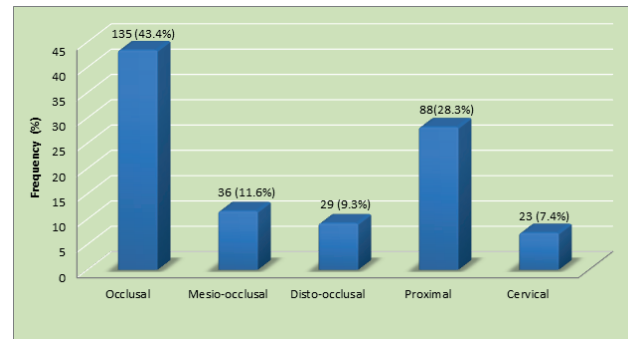


Figure 4: Frequency & percentage distribution of caries according to site.

Table II shows prevalence of caries was most commonly seen in posterior segment (89.1%) of both maxillary (47.4%) and mandibular jaw (41.7%) of overall cases. Occlusal surface caries is more common in mandibular (24.34%) tooth than maxillary (18.9%). Where, prevalence of proximal and cervical surface caries was higher in maxillary tooth (18.9% and 4.82%) than mandibular tooth (9.3% and 2.6%) respectively.

Table II: Number of caries surfaces (percentage in total caries) according to location

Location	Occlusal	Mesio-occlusal	Disto-occlusal	Proximal	Cervical
Maxillary	Anterior (0%)	02 (0.64%)	02 (0.64%)	13 (4.2%)	01 (0.32%)
	Posterior (18.9%)	19 (6.1%)	10 (3.2%)	46 (14.7%)	14 (4.5%)
Mandibular	Anterior (0.64%)	01 (0.32%)	02 (0.64%)	10 (3.2%)	00 (0.0%)
	Posterior (23.7%)	14 (4.5%)	15 (4.8%)	19 (6.1%)	8 (2.6%)

**Discussion:**

The results of the present study showed that anterior tooth were least like to be caries teeth, while posterior tooth were the most likely to caries in both maxillary and mandibular molars. Caries are also more prevalent in maxillary teeth than in mandibular teeth. The results of our study confirm the findings of Demirci M et al, who evaluate four years incidence of dental caries among Turkish people;<sup>17</sup> and Luen et al, who evaluated the ten-year incidence of dental caries in adult and elderly Chinese patients<sup>18</sup>. In our study, maxillary posterior (47.4%) were slightly more significantly affected than mandibular posterior (41.7%). Demirci M et al, finding is almost similar to us. Manji and Fejerskov reported that the lower molars were the most commonly affected teeth in the entire dentition. But in case of premolar and anterior tooth upper jaw's were affected more frequently than lower jaw<sup>19</sup>. Macek et al investigated the caries susceptibility of permanent teeth in six categories and found that molars were more susceptible than incisors, canines, or premolars, just as the results of the present study indicated<sup>20</sup>.

Occlusal surface caries is more common in mandibular (24.34%)

tooth than maxillary (18.9%). Where, prevalence of proximal and cervical surface caries was higher in maxillary tooth (18.9% and 4.82%) than mandibular tooth (9.3% and 2.6%) respectively. Demirci M et al, also describe that occlusal surfaces of premolars exhibited the second highest caries rate. When compared with other teeth, a smaller caries rate was generally observed on all sites, except occlusal surfaces and fissures in molars. Occlusal surfaces in permanent molars seem to have benefited least from the general decline. The cause for this fact could be a blend of complicated surface morphology and difficult access for effective oral hygiene. The result of the present study was in concurrence with a study conducted by Eklund and Ismail. They reported that occlusal caries beat all other types and increased most rapidly and to the highest levels in molars<sup>21</sup>. A study by Li et al found that the caries attack proportion was highest on occlusal surfaces of maxillary and mandibular permanent first molars, followed by second molars. Unlike the primary dentition, high caries rates in the permanent dentition were limited to pit and fissure surfaces of molars<sup>22</sup>. In the present study, it was found that molar teeth had many more caries than incisors, canines, or premolars in both sexes. Occlusal fissure sites in molars showed the highest caries rates in both sexes as well. The finding that more caries teeth were observed in women (57%) than in men (43%) is in agreement with findings of other studies<sup>17,23-24</sup>. According to Mansbridge<sup>25</sup> in general, permanent teeth erupt earlier in women than in men. As they are exposed to the risk of caries for a longer period, it is logical to assume that women's teeth would decay more than the teeth of their male counterparts of the same age. Our study also found that female patients continue to experience excessive caries. And we also found anatomical and behavioral differences between women and men in order to explain this observation<sup>23,25</sup>. Also a lot of factors affect the prevalence of caries on teeth surfaces in both genders, and these include education, income, lifestyle, etc. so, more study is needed to explain these factors. Caries is common in every age group from young to old age adult of our study patient. The prevalence of caries experience was highest (26.7%) among individuals of 25-34 years age group. And almost equally distributed among young patient (51.33%) who were under 34 years of age, and patients who were above 35 years of age (48.67%). Demirci M also reported that age does not affect caries prevalence in teeth surfaces<sup>17</sup> according to his study proximal surfaces of incisors, canines and premolars had the highest caries rates in all age groups, except for patients over the age of 65. On the other hand, occlusal surfaces of molars showed the highest caries rate. In addition, it was observed that molar teeth are more prone to caries than incisors, canines, or premolars in all age groups<sup>26</sup>. In addition has confirmed that mandibular molars are most vulnerable to dental caries in individuals between the ages of 4 and 20, employing a method that considered post-eruptive tooth age<sup>20</sup>. Caries rates of proximal, buccal and palatal surfaces were very low in all age groups, except for the caries rate of molars found in another study<sup>26</sup>. It should be known that most of the world's populations do not have right of entry to organized dental health care facility. Though, this circumstance makes it possible to study the natural history of dental caries<sup>18</sup>. There may also be differences in the prevalence of teeth surface caries between countries and with respect to geographic location, occupation, income, social class, ethnic group, education, lifestyle, etc. It was observed that a greater number of caries are experienced in younger age groups, and this rate decreases with age.

Findings in the United States show that caries rates in adults are similar to those of children<sup>27-28</sup>. But in Finnish adults, who had a constant proportion of decayed teeth, regardless of whether they were 35 or 65 years of age<sup>29</sup>. Manji F report that 'generally held view of caries experience being reduced with age' may not result from reduced caries activity, but from the reduced number of remaining teeth<sup>19</sup>. The cohort effect is an important factor (i.e., each age cohort is assumed to have a distinct lifestyle, socio-economic background, etc.) therefore, the rate at which carious lesions develop early in life, as a result of particularly favorable or unfavorable life conditions, will strongly influence caries levels later in life<sup>19</sup>. So cohort effects are importance when interpreting caries data from today's populations, where dramatic changes in caries experience occur even between age groups only separated by a few years<sup>19</sup>.

#### Conclusion:

Female are more prevalent to dental caries than male. Distribution of caries is higher in the posterior mandibular region compare to all other region of dental arch. Caries is common in every age group of patient, from young to old age adult. Occlusal surface caries is most commonly observed, then, the proximal surface caries are commonly seen. Occlusal surface caries is more common in mandibular tooth than maxillary. Where, proximal and cervical surface caries was higher in maxillary tooth.

**Conflict of Interest:** None.

#### Acknowledgement:

We are grateful to all teachers and staffs of the Dhaka Dental College Hospital & Sapporo Dental College Hospital.

#### References:

- Selwitz RH, Ismail AI, Pitts NB. Dental caries. *The Lancet*. 2007 Jan 6;369(9555):51-9. [https://doi.org/10.1016/S0140-6736\(07\)60031-2](https://doi.org/10.1016/S0140-6736(07)60031-2) PMID:17208642
- Petersen PE, Bourgeois D, Ogawa H, Estupinan-Day S, Ndiaye C. The global burden of oral diseases and risks to oral health. *Bulletin of the world health organization*. 2005;83:661-9.
- Nordenram G, Davidson T, Gynther G, Helgesson G, Hultin M, Jemt T, et al. Qualitative studies of patients' perceptions of loss of teeth, the edentulous state and prosthetic rehabilitation: a systematic review with meta-synthesis. *Acta Odontologica Scandinavica*. 2013 Jan 1;71(3-4):937-51. <https://doi.org/10.3109/00016357.2012.734421> PMID:23101439
- Kassebaum NJ, Bernabé E, Dahiya M, Bhandari B, Murray CJ, Marcenes W. Global burden of untreated caries: a systematic review and metaregression. *Journal of dental research*. 2015 May;94(5):650-8. <https://doi.org/10.1177/0022034515573272> PMID:25740856
- Chestnutt IG, Schäfer F, Jacobson AP, Stephen KW. Incremental susceptibility of individual tooth surfaces to dental caries in Scottish adolescents. *Community dentistry and oral epidemiology*. 1996 Feb;24(1):11-6. <https://doi.org/10.1111/j.1600-0528.1996.tb00804.x> PMID:8833507
- Hannigan A, O'Mullane DM, Barry D, Schäfer F, Roberts AJ.

A caries susceptibility classification of tooth surfaces by survival time. *Caries research*. 2000 Mar 31;34(2):103-8.  
<https://doi.org/10.1159/000016576>  
 PMid:10773626

7. Mejäre I, Källestål C, Stenlund H. Incidence and progression of approximal caries from 11 to 22 years of age in Sweden: a prospective radiographic study. *Caries research*. 1999 Jan 28;33(2):93-100.  
<https://doi.org/10.1159/000016502>  
 PMid:9892776

8. Edward S. Dental caries on adjacent approximal tooth surfaces in relation to order of eruption. *Acta Odontologica Scandinavica*. 1997 Jan 1;55(1):27-30.  
<https://doi.org/10.3109/00016359709091937>  
 PMid:9083572

9. Stenlund H, Mejäre I, Källestål C. Caries incidence rates in Swedish adolescents and young adults with particular reference to adjacent approximal tooth surfaces: a methodological study. *Community dentistry and oral epidemiology*. 2003 Oct;31(5):361-7.  
<https://doi.org/10.1034/j.1600-0528.2003.00015.x>  
 PMid:14667007

10. Kassebaum NJ, Bernabé E, Dahiya M, Bhandari B, Murray CJ, Marcenes W. Global burden of severe tooth loss: a systematic review and meta-analysis. *Journal of dental research*. 2014 Jul;93(7\_suppl):20S-8S.  
<https://doi.org/10.1177/0022034514537828>  
 PMid:24947899 PMCID:PMC4293725

11. Chan AK, Tamrakar M, Jiang CM, Lo EC, Leung KC, Chu CH. Common medical and dental problems of older adults: a narrative review. *Geriatrics*. 2021 Aug 6;6(3):76.  
<https://doi.org/10.3390/geriatrics6030076>  
 PMid:34449647 PMCID:PMC8395714

12. Saunders RH, Meyerowitz C. Dental caries in older adults. *Dental Clinics*. 2005 Apr 1;49(2):293-308.  
<https://doi.org/10.1016/j.cden.2004.10.004>  
 PMid:15755406

13. Twetman S. Prevention of dental caries as a non-communicable disease. *European journal of oral sciences*. 2018 Oct;126:19-25.  
<https://doi.org/10.1111/eos.12528>  
 PMid:30178558

14. Petersen PE, Baez RJ, World Health Organization. Oral health surveys: basic methods.

15. World Health Organization. Oral health surveys: basic methods. World Health Organization; 2013.

16. Watt ME, Lunt DA, Gilmour WH. Caries prevalence in the permanent dentition of a mediaeval population from the south-west of Scotland. *Archives of oral biology*. 1997 Sep 1;42(9):601-20.  
[https://doi.org/10.1016/S0003-9969\(97\)00061-7](https://doi.org/10.1016/S0003-9969(97)00061-7)  
 PMid:9403114

17. Demirci M, Tuncer S, Yuceokur AA. Prevalence of caries on individual tooth surfaces and its distribution by age and gender in university clinic patients. *European journal of dentistry*. 2010 Jul;4(03):270-9.  
<https://doi.org/10.1055/s-0039-1697839>

PMid:20613915 PMCID:PMC2897860

18. Luan WM, Baelum V, Fejerskov O, Chen X. Ten-year incidence of dental caries in adult and elderly Chinese. *Caries research*. 2000 Jun 1;34(3):205-13.  
<https://doi.org/10.1159/000016592>  
 PMid:10867418

19. Manji F, Fejerskov O: An epidemiological approach to dental caries; in Thylstrup A, Fejerskov O (eds): *Textbook of Clinical Cariology*. Copenhagen, Munksgaard, 1994, pp 159-191.

20. Macek MD, Beltran-Aguilar ED, Lockwood SA, Malvitz DM. Updated comparison of the caries susceptibility of various morphological types of permanent teeth. *Journal of public health dentistry*. 2003 Sep;63(3):174-82.  
<https://doi.org/10.1111/j.1752-7325.2003.tb03496.x>  
 PMid:12962471

21. Eklund SA, Ismail AI. Time of development of occlusal and proximal lesions: implications for fissure sealants. *Journal of public health dentistry*. 1986 Mar;46(2):114-21.  
<https://doi.org/10.1111/j.1752-7325.1986.tb03119.x>  
 PMid:3457950

22. Li SH, Kingman A, Forthofer R, Swango P. Comparison of tooth surface-specific dental caries attack patterns in US schoolchildren from two national surveys. *Journal of dental research*. 1993 Oct;72(10):1398-405.  
<https://doi.org/10.1177/00220345930720100901>  
 PMid:8408882

23. Antunes JL, Junqueira SR, Frazão P, Bispo CM, Pegoretti T, Narvai PC. City-level gender differentials in the prevalence of dental caries and restorative dental treatment. *Health & place*. 2003 Sep 1;9(3):231-9.  
[https://doi.org/10.1016/S1353-8292\(02\)00055-2](https://doi.org/10.1016/S1353-8292(02)00055-2)  
 PMid:12810330

24. Lin HC, Wong MC, Zhang HG, Lo EC, Schwarz E. Coronal and root caries in Southern Chinese adults. *Journal of dental research*. 2001 May;80(5):1475-9.  
<https://doi.org/10.1177/00220345010800051801>  
 PMid:11437223

25. Mansbridge JN. Sex differences in the prevalence of dental caries. *Br Dent J*. 1959;106:303-308.

26. Hopcraft MS, Morgan MV. Pattern of dental caries experience on tooth surfaces in an adult population. *Community Dent Oral Epidemiol*. 2006;34:174-183.  
<https://doi.org/10.1111/j.1600-0528.2006.00270.x>  
 PMid:16674749

27. Glass RL, Alman JE, Chauncey HH. A 10-year longitudinal study of caries incidence rates in a sample of male adults in the USA. *Caries Res*. 1987;21:360-367.  
<https://doi.org/10.1159/000261040>  
 PMid:3475182

28. Hand JS, Hunt RJ, Beck JD. Coronal and root caries in older Iowans: 36-month incidence. *Gerodontology*. 1988;4:136-139.

29. Tervonen T, Ainamo J. Constant proportion of decayed teeth in adults aged 25, 35, 50 and 65 years in a high-caries area. *Caries Res*. 1988;22:45-49.  
<https://doi.org/10.1159/000261082>  
 PMid:3422060