Prevalence of Tooth Decay and Associated Factors Among Ethiopian Patients

Bhumika Sehdev1, Lidya Muruts2, Kiran Kumar Ganji3

1Department of Periodontics, Mekelle University, Ayder Referral Hospital, Mekelle, Ethiopia.
2Department of Dentistry, Mekelle University, Ayder Referral Hospital, Mekelle, Ethiopia.
3Department of Periodontics, College of Dentistry, Jouf University, Sakakah, Kingdom of Saudi Arabia.

Author to whom correspondence should be addressed: Dr. Bhumika Sehdev, Associate Professor, Department of Periodontics, Mekelle University, Ayder Referral Hospital, Ethiopia. Phone: 0966346658. E-mail: bhumirocks9@yahoo.com.

Academic Editors: Alessandro Leite Cavalcanti and Wilton Wilney Nascimento Padilha

Received: 28 July 2019 / Accepted: 19 February 2020 / Published: 24 March 2020

How to cite this article: Sehdev B, Muruts L, Ganji KK. Prevalence of tooth decay and associated factors among Ethiopian patients. Pesqui Bras Odontopediatria Clín Integr. 2020; 20:e4835. https://doi.org/10.1590/pboci.2020.053

Abstract

Objective: To assess the prevalence of tooth decay and its associated factors among the age group of 15-20 years old visiting Ayder Comprehensive Specialized Hospital. Material and Methods: An epidemiological cross-sectional descriptive study was conducted among 384 subjects aged 15-20 years. A closed-ended questionnaire, according to the World Health Organization methodology was used to collect the data. The subjects were examined for the presence of tooth decay using the DMFT Index. One examiner was trained and standardized using a Kappa test (K=0.90). To test the differences in the DMF-T index related to socioeconomic variables, the Chi-square and the Mann-Whitney tests were employed. For all tests, the level of significance was set at p≤0.05 with 95% Confidence level. Results: The magnitude of tooth decay among study participants was 57.8%. The mean decayed, missed and filled was 1.26 and prevalence was higher in males (34.1%). Poor oral hygiene practice was strongly associated factor with tooth decay. 56.2% of visitors from the urban area were mainly affected by tooth decay. Conclusion: Tooth decay is highly prevalent among visitors between 15-20 years of age. Tooth brushing habit, residency, and consumption of sugary food and drinks were significantly associated with the occurrence of tooth decay. Early diagnosis and prompt treatment can prevent further damage.

Keywords: Dental Caries; Oral Hygiene; Toothbrushing; Preventive Dentistry.
Introduction

Tooth decay is one of the most prevalent health problems among the visitor in Dental institutions. Dental caries is a tenacious disease causing demineralization and dissolution of hard tissues of teeth. There are three predisposing factors for dental caries development like bacteria, carcinogenic food, and susceptible tooth surface. Also, dental caries is caused by preventable risk factors [1]. Streptococcus mutans and Actinomyces species are causative agents for enamel and root surface caries commonly affecting the population of lower socio-economic status. Recently, the incidence of dental caries is also increasing in a developed country. But its prevalence is lower for developed countries than developing once as there are more dental manpower, good hygiene practice and dental facilities in developed countries than developing once [1,2].

The growing consumption of sugary food in the developing world, poor tooth brushing habits, poor oral hygiene and low level of awareness about dental caries are some of the factors that increased the levels of Dental Decay [3-6]. However, limited research has been conducted on the prevalence and causes of tooth decay in Ethiopia. Hence the aim of the present study was to assess the prevalence, gender disparity and severity of tooth decay in 15 to 20 years old patients visiting Ayder Comprehensive Hospital.

Material and Methods

Study Population and Sample

The study was a cross-sectional survey of patients between the ages of 15 and 20 years visiting Ayder Hospital, Mekelle, located in the northern part of Ethiopia.

All the subjects within the age of 15-20 years, irrespective of the level of study were selected. A stratified random sampling technique was used to select the participants. Physically or mentally challenged patients, medically compromised or with gross dental/orofacial defects like cleft lip or cleft palate patients were excluded from the study. Third molars, congenitally missing teeth, supernumerary teeth, also, teeth restored for reasons (fracture, cosmetic purpose or use as a bridge abutment) other than tooth decay were also excluded from the study.

Data Collection

A closed-ended questionnaire, according to the WHO methodology [1], was used to collect the data. The questionnaire included two parts: the first part contained questions about socio-demographic characteristics of the study participants like age, gender, religion, and residency, while the second part included factors associated with tooth decay. The questionnaire assessed the oral practices of the subjects like items used for teeth cleaning, type of toothpaste used and intake of sugary food items (sugar consumption [yes /no] and frequency [occasionally /frequently]).

Dental examination was performed using a non-adjustable plastic chair under adequate natural light by a team headed by the researcher, who trained for 15 days prior to the study. Teeth were isolated, quadrant-by-quadrant, with the help of cotton rolls and then crowns of the teeth were examined individually for the presence of dental caries using sterile mouth mirror (Hu Friedy Mfg. Co., LLC, Chicago, IL, USA) and a periodontal probe (Marquis Dental Mfg. Co., Aurora, CO, USA). The observations were recorded in the separate assessment form.

Data quality was assured before data collection, during data collection and after data collection. A pretest was done among visitors of dental OPD in Mekelle, taking 5% of the sample before being deployed at the participating hospital. Based on the pretest results questionnaire was adjusted contextually. Individual
records were recorded in a prepared questionnaire format. The collected data was then checked for completeness and consistency. A specific nonoverlapping code was given for each variable.

Statistical Analysis

One examiner was trained and standardized using a Kappa test ($K=0.90$) before starting the study. All data were expressed as mean and standard deviation for continuous variables; frequencies and percentages were calculated for categorical data. Statistical analysis of the data was done using Statistical Package for Social Sciences (SPSS Inc., Chicago, IL, USA) 11.0 version and Excel 2000. To test the differences in the DMF-T index related to socioeconomic variables, the Chi-square and the Mann-Whitney tests were employed. For all tests, the level of significance was set at $p \leq 0.05$ with 95% Confidence level.

Ethical Considerations

An Ethical certificate was obtained from the Research and Ethical Committee/Institutional Review Board of Mekelle University. Informed consent was obtained from each participant to be examined.

Results

A total of 384 subjects participated in the study, among whom (47.9% were males, 28.6% were 20 years, 92.2% were Orthodox Christian and 76.6% were from an urban setting (Table 1).

| Variables       | N   | %   |
|-----------------|-----|-----|
| Sex             |     |     |
| Male            | 184 | 47.9|
| Female          | 200 | 52.1|
| Religion        |     |     |
| Orthodox        | 354 | 92.2|
| Muslim          | 30  | 7.8 |
| Residence       |     |     |
| Urban           | 304 | 76.6|
| Rural           | 95  | 23.4|
| Age             |     |     |
| 15 Years        | 81  | 21.1|
| 16 Years        | 51  | 13.3|
| 17 Years        | 61  | 15.9|
| 18 Years        | 30  | 7.8 |
| 19 Years        | 51  | 13.3|
| 20 Years        | 110 | 28.6|

More than two-thirds of the males ($n=131; 34.1\%) respondents had high caries prevalence whereas, females with carious teeth were 91 (23.7\%). The prevalence of caries among residents of the urban area was 56.2%, while among rural people it was 53.7%. Also, participants living in urban area were 1.78 times more prevalent for developing dental caries than those living in rural area.

Also, the mean DMFT score for the whole group was $2.50 \pm 2.21$. Decayed teeth (DT) were a major contributor to the DMFT; the proportion of decayed, missing, and filled teeth was 98.3%, 0.8% and 0.8%, respectively (Table 2).
Table 2. Components of DMFT Score.

| DMFT Components | DMFT Score | %    |
|-----------------|------------|------|
| Decayed (DT)    | 2.44 ± 2.13| 98.3 |
| Missing (MT)    | 0.03 ± 0.27| 0.8  |
| Filled (FT)     | 0.03 ± 0.2 | 0.8  |
| Total           | 2.50 ± 2.21| 100  |

Table 3 shows the relation between the frequency of sugar intake between meals and tooth decay. It implies a very significant positive correlation between the frequency of sugar consumption and dental caries.

Table 3. Association of sugar intake among the study population.

| Variables                          | Odds Ratio (CI 95%) | p-value     |
|------------------------------------|---------------------|-------------|
| Sugar Consumption                  | (dmft=0 versus dmft >0) | 0.17        | < 0.001*    |
| Frequency of Sugar Consumption     | (dmft=0 versus dmft >0) | 0.48        | <0.001*     |

*Statistically significant.

Table 4 shows the distribution of oral health knowledge among the participants. A total of 41.9% of participants cleaned their teeth once daily, while only 5.5% cleaned their teeth twice daily. Most of the participants (47.8%) used both local chew sticks and toothbrushes as oral hygiene methods. Also, 55.2% of the sample used toothpaste containing fluoride.

Table 4. Distribution of participants according to oral habits.

| Questions                          | N     | %    |
|------------------------------------|-------|------|
| How Often do You Clean Your Teeth?|       |      |
| Once a Month                       | 20    | 5.2  |
| 2-3 Times a Month                  | 10    | 2.6  |
| Once a Week                        | 81    | 21.1 |
| 2-6 Times a Week                   | 91    | 23.7 |
| Once a Day                         | 161   | 41.9 |
| Twice or More a Day                | 21    | 5.5  |
| What do You Use to Clean Your Teeth?|       |      |
| Toothbrush and Traditional Stick   | 180   | 47.1 |
| Toothbrush Only                    | 62    | 15.9 |
| Traditional Stick                  | 142   | 37   |
| Do You Use a Toothbrush            |       |      |
| With Toothpaste                    | 212   | 55.2 |
| Without Toothpaste                 | 172   | 44.8 |

Discussion

This study attempted to assess the prevalence and associated factors of tooth decay among patients attending Ayder comprehensive Specialized Hospital. The overall prevalence of tooth decay found was 57.80%, which was consistent with a study in Finote Selam, Ethiopia (48.5%) [7], 30.5% in Sudan [8], 37% in Kenya [9] and 21.8% in Bahirdar city, Ethiopia [10]. In this research the high prevalence of dental caries is due to the facts such as variation in study population, time of study and study characteristics. Such variations occur as it is institutional centered study and also, there might be high patient flow in health institutions compared to the community level, which specifies that there is a need to promote oral health [11].

In this research, the factors associated with the occurrence of tooth decay were socio-demographic differences, place of residence, oral hygiene status and educational status. In addition, this study showed that
the prevalence of tooth decay was more in males, 34.1% as compared to females. This finding is similar to the study done in Northern Appalachia [12]. This might be due to the fact that adult women utilize dental health care to a greater degree than men.

This study showed that patient who lived in urban had 1.78 times chance of developing dental caries than those patients who were living in rural. Similar findings were reported by recent report, which demonstrated that patients living in urban settings had more access to consume more sugary foods leading to more prevalence of tooth decay [11].

The mean DMFT values ($2.50 \pm 2.21$) in present study were lower than the values obtained from other studies [13-15], while they were equal to study developed in India [16]. Food habits play an important role in the causation of dental caries. The introduction of refined sugar into the modern diet has been associated with increased caries prevalence. Present study evaluated the association between the sugar in diet and dental caries the patients who were divided into three groups depending upon the total number of sugar exposures/day i.e., frequently (more than 4 sugar exposures/day), moderately (2-3 sugar exposures/day) and occasionally (1 sugar exposure/day).

The findings of this study showed considerably higher caries prevalence in the sweet eating group compared to those who did not eat sweets. The findings of the present study reconfirm the importance of sugar as one of the major etiological factors, which are consistent with the previous findings [17-20]. However, some authors [21] found no significant relationship between sugar consumption and caries prevalence. The study found that tooth decay was lower among respondents who cleaned their teeth with toothpaste and toothbrush were 95 times less likely to be affected by dental caries as compared to those patients who used only a traditional stick. This finding is typically similar to the studies done in Finote Selam [7] and Bahirdar [10]. However, a study in Kenya have found that brushing habit has no significant effect on the prevalence of dental caries, which is contradictory to the results of the present study [9].

Also, the study revealed that those who used to brush twice a day had significantly less prevalence of dental caries as compared to those whose brushing habit is either once daily or not every day. In the present study, 5.5% patients had brushing habit more than once per day. However, previous authors found 16.7% of patients had the brushing habit more than once a day [22] and the overall prevalence of dental caries is less in their study as compared to the present study.

Various limitation of present study could be pointed namely, information was not obtained concerned to daily diet protocol, Oral Hygiene Index should have been used to assess oral hygiene status. Finally, only individual-level factors were addressed in this study that are concerned as factors affecting the prevalence of tooth decay among the enrolled patients,

All the visitors need to be aware that improved oral hygiene practices and reducing sugary food consumption benefits in their oral health, to prevent tooth decay, and also improves their health status. In addition, the Regional Health Bureau should incorporate oral health education in the community. The community should develop a system of routine dental visits once every six months, and there should be further study.

**Conclusion**

The prevalence of tooth decay was high and could predict that educational status, oral hygiene status, and place of residence were important predictors of the prevalence of dental caries among patients attending Ayder Comprehensive Hospital. Therefore, integrating oral health promotion services with other health
services at the cause root level could have a significant impact and likely to benefit the community’s oral health problem. Health promotion about oral hygiene is supremely important for the prevention of the problem of tooth decay.

Authors’ Contributions

| Author | Contribution Details |
|--------|----------------------|
| BS     | Conceptualization, Methodology, Investigation, Data Curation, Formal Analysis and Supervision. |
| LM     | Conceptualization, Methodology, Investigation, Data Curation, Formal Analysis, Writing – Original Draft Preparation and Supervision. |
| KKG    | Conceptualization, Data Curation, Formal Analysis, Writing – Original Draft Preparation, Writing – Review and Editing, Supervision. |

All authors declare that they contributed to critical review of intellectual content and approval of the final version to be published.

Financial Support

None.

Conflict of Interest

The authors declare no conflicts of interest.

References

[1] World Health Organization. Oral Health Surveys. Basic Methods. 5th ed. Geneva: World Health Organization; 2013.
[2] Munjal V, Gupta A, Kaur P, Garewal R. Dental caries prevalence and treatment needs in 12 and 15-year-old school children of Ludhiana city. Indian J Oral Sci 2013; 4(1):27-30. https://doi.org/10.4103/0976-6944.118523
[3] Araya YN. Contribution of trees for oral hygiene in East Africa. Ethnobot Leaf 2007; 11:38-44.
[4] Taani DQ. Caries prevalence and periodontal treatment needs in public and private school pupils in Jordan. Int Dent J 1997; 47(2):100-4. https://doi.org/10.1111/j.1875-995X.1997.tb00683.x
[5] Punitha VC, Anudhan A, Sivaprakasam P, Rathanaprabu V. Role of dietary habits and diet in caries occurrence and severity among urban adolescent schoolchildren. J Pharm Bioalli Sci 2015; 7(Suppl 1):S296-S300.
[6] Petersen PE. Improvement of oral health in Africa in the 21st century - the role of the WHO Global Oral Health Programme. Develop Dent 2004; 5(1):9-20.
[7] Teshome A, Yitayeh A, Gizachew M. Prevalence of dental caries and associated factors among Finote Selam primary school students aged 12-20 years, Finote Selam Town, Ethiopia. OHDM 2016; 15(1):36-41.
[8] Nurellhuda NM, Trovik TA, Ali RW, Ahmed MF. Oral health status of 12-year old school children in Khartoum state, Sudan; a school-based survey. BMC Oral Health 2009; 9:15. https://doi.org/10.1186/1472-6831-9-15
[9] Gathecha G, Makokha A. Dental caries and oral health practices among 12-year old children in Nairobi west and Mathira west Districts, Kenya. Pan Afr Med J 2012; 12:22.
[10] Mulu W, Demilie T, Yimer M, Meslesha K, Abera B. Dental caries and associated factors among primary school children in Bahir Dar City: a cross-sectional study. BMC Res Notes 2014; 7:949. https://doi.org/10.1186/1756-0500-7-949
[11] Tafere Y, Chanie S, Dessie T, Gedayu H. Assessment of prevalence of dental caries and the associated factors among patients attending dental clinic in Debre Tabor general hospital: a hospital-based cross-sectional study. BMC Oral Health 2018; 18:119. https://doi.org/10.1186/s12903-018-0581-8
[12] Shaffer JR, Leslie EJ, Feingold E, Govil M, McNeil DW, Crout RJ, et al. Caries experience differs between females and males across age groups in Northern Appalachia. Int J Dent 2015; 2015: 938213. https://doi.org/10.1155/2015/938213
[13] Retaonkumari N. Prevalence of dental caries and risk assessment among primary school children of 6-12 in the Varkala municipal area of Kerala. J Indian Soc Pedod Prev Dent 1999; 17(4):135-42.
[14] Villalobos-Rodelo JJ, Medina-Frechero N, Vallejos-Sanchez AA, Pontigo-Loyola AP, Espinoza-Beltran JL. Dental caries in school children aged 6-12 years in Navolato, Sinaloa, Mexico; experience, prevalence, severity and treatment needs. Biomedica 2006; 26(2):224-33.
[15] Goyal A, Gauka K, Chawla HS, Kaur M, Kapur A. Epidemiology of dental caries in Chandigarh school children and trends over last 25 years. J Indian Soc Pedod Prev Dent 2007; 25(3):115-8. https://doi.org/10.4103/0970-4388.36559
[16] Saravan S, Anuradha KP, Bhaskar DJ. Prevalence of dental caries and treatment needs among school going children of Pondicherry, India. J Indian Soc Pedod Prev Dent 2013; 21(1):1-12.

[17] Winter GB, Rule DC, Mailer GP. The prevalence of dental caries in pre school children aged 1-4 years. Br Dent J 1971; 130(10):434-6.

[18] Gupta A, Tiwari A, Chawla HS. Relationship of dental caries and diet. An epidemiological study in Andhra pradesh. J Indian Soc Pedod Prev Dent 1988; 6(1):1-11.

[19] Szpunar S, Eklund SA, Burt BA. Sugar consumption and caries risk in school children with low caries experience. Community Dent Oral Epidemiol 1995; 23(3):142-6.

[20] Sanders A, Cardel M, Laniado N, Kaste L, Finlayson T, Perreira K, Sotres-Alvarez D. Diet quality and dental caries in the Hispanic Community Health Study/Study of Latinos. J Public Health Dent 2020; 2020. https://doi.org/10.1111/jphd.12358

[21] Weissenbach M, Chau N, Benamghar L, Lion C, Schwartz F, Vadot J. Oral health in adolescents from a small French town. Community Dent Oral Epidemiol 1995; 23(3):147-54. https://doi.org/10.1111/j.1600-0528.1995.tb00219.x

[22] Datta P, Datta PP. Prevalence of dental caries among school children in Sundarban, India. Epidemiol 2013; 3(4):1-4. https://doi.org/10.4172/2161-1165.1000135