Magnitude of dental caries and its associated factors among governmental primary school children in Debre Berhan town, Ethiopia

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Abstract

Background: Globally, it is estimated that 2.4 billion people suffer from caries of permanent teeth and 486 million children suffer from caries of primary teeth. It has detrimental consequences on children's quality of life by inflicting pain, premature tooth-loss, and malnutrition and finally influences overall growth and development. In Ethiopia, oral health prevention and treatment gets low attention in the government and the existing dental services are private owned and expensive. Hence, the aim of this study was to assess the prevalence of dental caries and its associated factors among governmental primary school children in Debreberhan town, Ethiopia, 2019. **Method-** An institutional based cross-sectional study was conducted from January 30– February 14/2019. A total of 417 primary school children were selected using computer generated simple random sampling and interviewed using structured and pretested questionnaires. Data was coded, entered and cleaned using epi-data version 3.1 and export to SPSS version 22 for analysis. Descriptive statistics, and binary logistic regression analysis was employed to test the association between dependent and independent variables. P-value less than 0.05 was taken as significant association. Finally, the result of this study was presented by text, table and graph. **Result:** Out of the 396 study participants, 135 (34.1%) had dental caries. Of these, more than half, 95(59.37%) had pre-molar decayed. Two hundred eighty-five (72.0%) of them were cleaned their teeth. Independent predictors of dental caries were drinking sugared tea [AOR= 2.034, 95%CI: (1.223-3.385)], and food particle on their teeth [AOR= 6.709, 95% CI: (3.475- 12.954)], had shown significant association with dental caries. **Conclusion:** The overall magnitude of dental caries was 34.1%, which is relatively high and found to be a public health problem. Drank sugar tea, presence of food particle or dental plaque were significantly associated with dental caries. In contrast, merchant occupation, was reduced the chance of dental caries. Give health education to minimize drank sugar tea and clean their teeth after consumption of sugar tea could be emphasized.

Background

Dental caries is one of the global oral health problems, which cause the destruction of the hard parts of a tooth by the interaction of bacteria and fermentable carbohydrate (1). Now a day dental caries on the rise to become major public health problems worldwide, it is estimated that 2.4 billion people suffer from caries of permanent teeth and out of them around 486 million children suffer from caries of primary teeth (2). Dental caries has detrimental consequences on children's quality of life by inflicting pain, eating and speaking, premature tooth-loss, undernutrition and finally influences overall growth and development (3-6). Although poor oral health is not life-threatening, it causes teeth pain, eating impairment, loss of tooth, delay language development, decrease educational concentration in school and has high financial burden on the families (7, 8).

Dental caries is a progressive infectious process with a multifactorial aetiology (9, 10). Dental caries has high morbidity potential (7). The frequent intake of sweets, dry mouth, and poor oral hygiene increase the chances for cavities (11). The early childhood caries pattern changes at age three and begins to affect the first and second primary molars in developing countries including Ethiopia (12, 13). The prevalence of

dental caries among pre-school children of developed nations has been declining over the past few decades(14, 15).However it is still high among pre-schoolers of developing nations (16-18). Previous research has shown that, a study done in Thailand revealed that the magnitude of dental caries was 43.6 % (19),in china among 3 to 5 year old age was 70.4%(20), in India 63.4% (21), and Eastern Saudi Arabia was 73% (22).

The prevalence of dental caries in Africa was reported to be varies from 12.6- 24.1% in Nigeria (23, 24), 43.3% in Kenya (25), and 30.5%in Sudan (26). According to recent community based study done in Ethiopia indicated that dental caries was 21.8% (27), in Addis Ababa among young adolescence was 47.4% (28) and in Gonder town 36.3% (29). Other study done in Finote Selam, Ethiopia showed that 48.5% of the students had dental caries (30). Overall ,dental caries may influence children's development and their participation in important daily activities (6).

According to the report of different study sex, age, dietary habits,education, and oral hygiene status are associated with increased prevalence of dental caries (25, 27, 31). Likewise, the growing consumption of sugared foods 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 (23, 32-34). On the contrary frequent tooth brushing was a lower chance of having decayed (5).

To the best of our knowledge ,in Ethiopia, few studies about demographic and socio-economic variables as risk factors of dental caries had been published (28, 29). However, oral health prevention and treatment has gotten low attention in the government and the existing dental services are private owned and expensive. As the finding of previous studies shows, dental caries is the public health problem among school children and there was no published research on the magnitude of dental caries in primary school children in the study area. Therefore, the objective of this study was to assess the prevalence of dental caries and its associated factors among governmental primary school children in Debre Berhan town, Ethiopia.

Methods

Study design and setting

An institution based cross-sectional study was conducted from January30–February 14/2019. This study was conducted in Debre-Berhan town primary school's students. Debre-berhan town were located in North Shoa Administrative Zone, Amhara National Regional State, Ethiopia. Located at a distance of 130 km, North East of Addis Ababa (capital city of Ethiopia), 682 km of capital city of Amhara regional state Bahir Dar. The total population size of the district was putted as 108,876 out of which 49,259 were male and 59,617 were female(35). The Debre-Berhan town had 10 governmental primary schools and the total number of primary school students were 7,198 students, out of these the study subject were 3,607 students (36)

Study participants

Children from governmental primary schools students who is grade 1-8, present during the data collection period, those were lived in the study area at least for six months and were able to give response were included in the study. Children with 18 years of age and above, and those who were mentally ill, who could not reply interview and unable to hear were excluded from the study.

Sample size estimation

Sample size was calculated using single population proportion formula with an assumption of 95% confidence level, 5% degree of precision and proportion of dental caries, 21.8 %[\(27\)](#). After adding 10% non-response rate and 1.5 design effect the final sample size of the study was 417. Of them, 396 students provided a complete response.

Sampling procedure

Our study sample was obtained by two stage cluster sampling technique. In the first stage, out of ten governmental primary schools, four schools were selected by using simple random sampling technique and the sample size was allocated proportionally to each selected schools, based on the number of students. In the second stage, the study participants were selected from each grade and sections of the selected schools by simple random sampling technique using computer generated method proportionally to the number of students in each and sections. A list of the students was taken from their rosters in respective class.

Data collection

A data collection questionnaire was developed from different previous similar literatures [\(27, 30, 32, 37\)](#). A face-to-face interview structured questionnaire prepared in English, which contain socio-demographic data, and factors that contribute caries to exist among the study participants was prepared. To ensure quality of the data, the questionnaire was initially develop in English and translated to local language Amharic by expert and then back to English to ensure consistence. Dental examination was carried out for all selected children by one trained dental doctor using World Health Organization (WHO) dental caries diagnosis guide line under natural day light [\(38\)](#). Other than the outcome variables the data was collected by 5 BSC nursing student. Before going to the actual data collection the questionnaire was pretested in similar setting outside the study district 5% (21) in model kutir 1 primary school. The questionnaire was modified based on the response after the pre-tested and modification was made into the final version of the data collection tool. Trained on data, collection was given to data collectors and supervisors for one day before actual data collection task and trained guide was prepared to facilitate the training. All data collectors were trained on their responsibilities for describing the purpose of the study, how to collect the data and telling clients the importance of honest and genuine reply on responding to questions. Lastly, the principal investigator was strictly follow the overall activities of the data collection on daily base to ensure the completeness of questionnaire and to give further clarification. To avoid ethical and equality issue, all 396 children with permitted consent were examined. Ethical approval was obtained from the Research Ethical Committee, college of health science, Debre Berhan University.

Data processing and analysis

Data was coded, cleaned, entered and edited using Epi-data version 3.1 and exported to SPSS version 22 for analysis. Descriptive statistics, like frequency and percentage was used depending on the nature of the variable. All variables, which become significant with p value of ≤ 0.25 in the bivariable analysis was fitted in to the multivariable logistic regression. The 95% confidence interval and variables having p - value less than 0.05 in the multivariable model was consider as significantly associated with the dependent variable. Adjusted Odds Ratio (AOR) with 95% confidence interval (CI) was use to see the strength of the association between dependent and independent variables. Finally, finding of the study was display by using texts, tables and graph.

Result

Socio-demographic characteristics of the study participants

A total of 417 eligible primary school students were interviewed with nearly 95% response rate. The mean age of participants was 12.74 (SD $\pm$ 2.556) with range of 11-14 years old. More than half, 218(55.1%) of students were females. Nearly half, 197(49.71%) of students were 11-14 age. Most of marital status of participant parent 293(74%) were married. Regarding with the residency majority of participant, 334 (84.3%) were urban (table 1).

Food consumption pattern, dietary habits and practices related to oral hygiene

According to our study most 307(77.5%) of students were get meal three times per days. Fifty-four (13.6%) of the participants drank coffee with sugar. Most,307(77.5%) of the students were drank soft drinks. One hundred twenty-nine (32.6%) of the students used to eat sweet food. Majority 373(94.2%) of student often use sweet food and drinks. In our study most, 285(72.0%) of them were cleaned their teeth. Out of them, 15(5.62%) cleaned teeth after every meal. However, nearly half 132(46.32%) of children cleaned their teeth once per days. Similarly nearly half 140 (49.12%) of children were cleaned their teeth morning. Among participant 128 (44.91%) of them were used teeth brush with paste. However, 122 (42.81%) and 33(11.58%) were used teeth brush with mefakia and only tooth brush, respectively to clean their tooth (Table 2)

Magnitude of dental caries

Out of the 396 study participants, 135 (34.1%) had dental carries. More than half, 95(59.37%) of the students had pre-molar dental carries. According to our study, 28(7.1%) had missed teeth. Of these nearly half 12(42.86%) of the missed teeth was pre-molar (figure1).

Factors associated with dental caries

According to this study, children who drank sugared tea frequently had 2 times [AOR=2.03%CI: (1.22; 3.38)] a chance of developing dental caries than those who drank sugared tea rarely. Similarly, students

who had food particle on their teeth were 7 times [AOR= 6.70, 95%CI: (3.47; 12.95)] more likely to develop dental caries than those who did not have food particle on their teeth. However, Dental caries among children, whose parents' occupation of merchant were 53% [AOR= 0.47, 95 %CI: (0.24; 0.91)] less likely chance of developing dental caries compared to those who had private worker parent. Similarly, Students who ate sweet foods had 57.8 % less likely [AOR= 0.42, 95 %CI: (0.24; 0.71)] a chance of developing dental caries than those who no use sweet foods (Table 3).

Discussion

According to this study, the prevalence of dental caries among school children was 34.1%, which is higher than studies conducted in Bahir Dar (21.8%) (27), Nigeria (24.1%) (23) and Sudan (30.3%) (26), but lower than other studies in Kenya 43.3 % (25) and Finote-Selam (48.5%) (30). The possible explanation about the variations might be the dental health consideration and the awareness level of most of Ethiopians; including Debre-berhan town school students is low. Other possible explanation might be the different study area and period.

Based on this study, the prevalence of dental caries was higher in male students 61(34.27%) than females 74(33.9%). This result was not supported by the studies done in Bahir Dar (28), Finote- Salam (32) and in Kenya (30). This discrepancy might be due to other co-founding factors like brushing habit and dietary habits.

According to our study, age of participant, 34(36.56%) participant age group 7-10 had dental caries. Grade 1-4 students 47(35.9%) were more prevalent than grade 5-8 students 88 were (33.2). However, in Bahir Dar study, the proportion of dental caries was 33.3% (27) in children from 6 to 10 years of age. The proportion of dental caries was 23 (31.9%) and nine (12.2%) among children from grade1-4 and 5-8, respectively. The possible reason might be when the age and education level increase the awareness about the dental carries and oral health may be increase.

Concerning about the residence in this study, the students who were lived in rural 25(40.32%) had high prevalence than urban area 110(33%). This finding was supported by studies done in Zimbabwe (39). However, this result was not in lined with Finote-Selma's study and in Uganda (30, 40). The possible reason may be the awareness of oral hygiene in rural is low.

According to the current study, 128(32.2%) children used toothbrush with paste to clean their teeth whereas 122(30.8%) children used a traditional small stick of wood (termed as Mafaqiya) made of a special type of plant to clean their teeth. However, the study done in Bahir Dar city reported that 67.6% of children cleaned their teeth using traditional small stick of wood (Mafaqiya) for maintaining oral hygiene (27). This might be due to the poor habit and improper usage of the tooth brushing sticks in the country.

Recent study, showed that more than half, 95(59.37%) of the respondents had pre-molar decayed and 28(7.1%) had missed teeth, of them about nearly half, 12(42.86%) of missed teeth were pre-molar. which is in line with a study done in Finote-Selam study, dental caries was most prevalent in pre- molar (42.2%)

(30), and the study done in Nigeria of which (46.5%) was on pre-molar (23). This might be due to its first eruption and main role in mastication.

Based on this study, dental caries among not cleaned their teeth were 41 (36.9%). Whereas a study done in Finote-Selam is a round 76.9% students who never brush their teeth had dental caries (30). This may be due to not knowing the advantage of brushing teeth and difference might be study area and period.

Dental caries among children, whose parents' occupation of merchant were 53% times less likely a chance of developing dental caries compared to those who had private worker. However, in other study no association between parent occupation and dental caries. Hence, further study is need to investigate the possible association of occupation and dental caries

According to this study, students who drank sugared tea frequently had 2 times more likely a chance of developing dental caries than those who drank sugared tea rarely. However, this result was not supported by other studies (27, 30). This might be due to the difference habits of drank sugared tea across different area of the studies and the participants these studies were not brush their teeth after drank sugared tea.

Regarding about the food particle, students who had food particle or plaque on their teeth were 7 times more likely to develop dental caries than those who did not have food particle on their teeth. This study was supported by a study done in Bahir Dar (28). According to this study, students who ate sweet foods frequently found to be 2.4 more likely to developing dental caries than those who use sugared foods sometimes. This study is in line with , the study done in Finote-Selam (30) and Kenya (25).

This research finding has provided important baseline information and evidence regarding the overall magnitude of dental caries and its associated factors, even though, there were some limitations; first, the study design is cross-sectional; hence, it does not show which one is come first effect or cause. Second, behaviour aspects of the children cannot understand merely by quantitative study. Third, detection of dental caries using dental mirror and radiology was not possible because of lack of instruments and laboratory set up.

Conclusion

The over magnitude of dental caries were 34.1%, which is relatively high. Drank sugar tea, presence of food particle or dental plaque were found to be significantly associated with dental caries. In contrast, merchant occupation, was reduced the chance of dental caries.

Abbreviations

AOR: adjusted odd ratio; COR: crude odd ratio; SPSS: Social Package Statically Software; WHO: World Health Organization.

Declarations

Ethics approval and consent to participate

Ethical clearance and paper of approval was obtained from Debre-berhan University, institute of Medicine and College of health sciences. In addition, the supportive letter was written from department of pediatric and child health nursing. After that permission was obtained from the Debre-berhan Town education bureau and from each primary school. Finally, verbal informed consent was obtained from parent's to conduct the study. Verbal informed consent because in our university we obtain ethical clearance, after that we are explaining the risk and benefit of the research and then we under take data collection. Furthermore, cases of dental caries were advised to attend the nearby dental clinic.

Consent for Publication

Not applicable.

Availability of data and materials

All relevant data are in the manuscript. However, the minimal data underlying all the findings in the manuscript will be available upon request to corresponding author.

Competing interest

The authors declare that they have no competing interest.

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Authors' contributions

All authors equally participated in the design, conception, analysis, and interpretation. GA, RM, BD and WS facilitated the data collection and drafted. WS,BM,SM and YA were made critical revision the manuscript for important intellectual content. All had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. All authors read and approved the final manuscript.

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Tables

Table 1.

Variable	Category	Frequency	Percent (%)
Sex of participant	Female	218	55.1
	Male	178	44.9
Age of participant	7-10	93	23.48
	11-14	197	49.74
	15-19	106	26.76
Educational status	1-4	131	33.1
	5-8	265	66.9
Educational status of fathers	Illiterate	78	19.7
	Can read and write	102	25.8
	Grade 1-8	91	23.0
	Grade 9-12	66	16.7
	Diploma and above	59	14.9
Educational status of mother	Illiterate	130	32.8
	Can read and write	88	22.2
	Grade 1-8	89	22.5
	Grade 9-12	60	15.2
	Diploma and above	29	7.3
Residency	Urban	334	84.3
	Rural	62	15.7
Marital status of	Married	293	74.0
	Single	5	1.3
	Divorce	61	15.4
	Widowed	37	9.3
Occupation of parents	Farmer	80	20.2
	Merchant	131	33.1
	Government employee	101	25.5
	private worker	84	21.2

Table 2.

Variable	Category	Frequency	Percent (%)
Get meal per days	Once per days	1	3
	Three times per days	307	77.5
	Four times per days	88	22.2
Ate break fast	Bread with tea	311	78.5
	Pasta or mokoroney	18	4.5
	Injera with wot	65	16.4
	Kinche	2	2.05
	Others	2	0.5
Drink sugar tea	Yes	151	38.1
	No	245	61.9
Drink sugar coffee	Yes	54	13.6
	No	342	86.4
Drink soft drink	Yes	307	77.5
	No	89	22.5
Eat sweet food	Yes	129	32.6
	No	267	67.4
How often use sweet food	Daily	6	1.5
	Once per days	17	4.3
	Occasionally	373	94.2
Food particle or plaque	Yes	280	70.7
	No	116	29.3
Use tooth brush	Yes	285	72.0
	No	111	28.0
Frequency of tooth brush	After every meal	15	3.8
	Twice per days	53	13.41
	Once per days	132	33.3
	Sometimes	85	21.5
Time of brushing	Morning	140	35.4
	Before bed	1	0.3
	Mixed	62	15.7

	No fixed	82	20.7
Type of brushing	Tooth brush with paste	128	32.3
	Only tooth brush	33	8.3
	Mefakia	122	30.8
	Charcoal	2	0.5

Table 3.

Variables	Dental caries		COR(95%CI	AOR(95%CI)
	No	Yes		
Educational level of participant father				
Illiterate	51	27	2.07(0.94:4.55)	1.36(0.57:5.12)
Can read and write	62	40	2.52(1.19:5.34)*	1.92(0.55:6.68)
Grade 1-8	55	36	2.56(1.19:5.48)*	1.33(0.38:4.61)
Grade 9-12	46	20	1.70(0.74:3.87)	0.99(0.29:3.34)
Diploma and above	47	12	1	1
Educational level of participant mothers				
Illiterate	84	46	2.09(0.79:5.52)	0.76(0.18:3.18)
Can read and write	55	33	2.30(0.84:6.23)	0.94(0.22:3.98)
Grade 1-8	59	30	1.94(0.71:5.29)	0.74(0.18:3.02)
Grade 9-12	40	20	1.91(0.67:5.45)	0.93(0.24:3.65)
Diploma and above	23	6	1	1
Occupational of parent				
Farmer	52	28	0.59(0.31:1.11)	0.51(0.24:1.08)
Merchant	90	41	0.50(0.28:0.88)*	0.47(0.24:0.91)*
Government employee	75	26	0.38(0.20:0.70)*	0.62(0.26:1.46)
Private worker	44	40	1	1
Drink sugar tea				
Yes	86	65	1.89(1.23:2.89)*	2.03(1.22:3.38)*
No	175	70	1	1
Drink sugar coffee				
Ye	31	23	1.52(0.84:2.73)	1.23(0.61:2.46)
No	230	112	1	1
Eat sweet food				
Yes	94	35	1.61(0.39:0.98)*	2.42(0.24:0.71)*
No	167	100	1	1
Frequency of tooth brush				
After every meal	7	8	1.02(0.56:1.83)	1.31(0.64:2.67)
Twice per days	38	15	1.99(0.65:6.01)	7.93(0.94:66.41)
Once per days	92	40	0.68(0.32:1.44)	3.27(0.40:26.48)
Sometimes	54	31	0.75(0.42-1.34)	0.19(0.03:1.02)
No	70	41	1	1
Time of tooth brushing				
Morning	93	47	1.01(0.56:1.83)	---
Before bed	1	0	0.87(0.49:1.54)	4.10(0.78:21.43)
Mixed	45	17	0.00(0.00,---)	0.000(0.00:---)
No fixed	52	30	0.65(0.32:1.34)	0.214(0.02:1.71)
No	70	41	1	1
Presence of food particle on teeth or plaque accumulation				
Yes	160	120	5.05(2.79:9.12)*	6.70(3.47:12.95)*
No	101	15	1	1

Health education by television				
Yes	108	44	0.68(0.44:1.05)	0.75(0.44:1.28)
No	153	91	1	1

*indicates that the variables significantly associated with the outcome at bivariable and multivariable analysis 95% level of significant ($P < 0.05$).

Figures

Figure 1

shows prevalence of dental caries of study participant in Debre-berhan town, Ethiopia,2019.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [STROBEchecklistcrosssectional1.doc](#)