*Original Article*
# The effect of sugary food and beverages combined with lack of tooth brushing increases the prevalence of dental caries among school-age children in Debark town Ethiopia: a community-based study

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**Abstract:** Background: Dental caries is the most common preventable illness in children. If not giving appropriate care leads to chronic disease since 90% of school-age children have been affected. Hence it is one of the most health problems of school-age children in Sub-Saharan African countries like Ethiopia. Our study aimed to assess the effects of sugary food and beverages combined with a lack of tooth brushing on the prevalence of dental caries among school-age children in Debark town Northwest Ethiopia in 2021. Methods: A community-based cross-sectional study was conducted among 613 school-age children in Debark, Ethiopia from March 1 to April 1, 2021. Multi-stage sampling technique was used to select kebeles. Pre-tested questionnaires and observational checks lists were used to collect the data. Data were cleaned, edit and enter into Epi-data 3.2.1 and transferred to SPSS version 25 for analysis. Descriptive statistics were computed and results were presented with tables, figures, and texts. A binary logistic regression model was used for bi-variable and multivariable logistic regression analyses. *P*-value < 0.2 in the bi-variable logistic analysis was then entered into multivariable analysis, and the associated factors were declared using odds ratio and *P* value < 0.05 with 95% CI. Results: In our study, 634 participants were enrolled and 96.7% responded. The mean age of parents, and children was 37.74 (SD ± 8.2) and 9.94 (SD ± 2.4 years), respectively. The prevalence of dental caries was 37.7% [95% CI: 34%-41.7%]. Factors associated with dental caries were maternal literacy [AOR=2.6, 95% CI: 1.4-4.7], use of health insurance [AOR=2.4, 95% CI: 1.55-3.66], frequent sweet tea consumptions [AOR=1.8, 95% CI: 1.21-2.67], consumption of sugary foods > 3 times per day [AOR=5.7, 95% CI: 1.97-16.7], and lack of habit for teeth brushing [AOR=3.5, 95% CI: 1.68-7.10]. Conclusion: The prevalence of dental caries in this study was found high. Maternal education, health insurance, dietary factors such as regular consumption of sweet tea, and sugary foods, and lack of habits to teeth brushing. The authors recommended addressing maternal awareness for child's supervision of daily tooth brushing or oral hygiene, minimizing the intake of beverages, and sugary food consumption, and using health insurance as a way to improve this population's oral health.

**Keywords:** Dental caries, school-age children, oral health, Ethiopia

## Introduction

Dental caries (Dc) are lesions of the teeth surface or presence of dental plaque, missing teeth, and losses of the hard parts of teeth and are called "tooth decay". DC usually comes from bacterial actions through food degradation on the tooth with the production of acid that damages enamel [1, 2].

It is the most common preventable childhood illness but if untreated, it leads to chronic childhood disease starting to mild dental infection or pain through mental retardation such as delayed language development, impaired cognitive development, and organ problems like diabetes mellitus, and heart diseases. In addition, untreated dental caries may progress to a severe form of dental disease and organ failures [3-5].

Globally, around 60-90% of school-age children have been affected by dental caries [6-8]. The World Health Organization (WHO) declared as dental carries are the 10th most prevalent disorder conversely it affects 621 million children worldwide [9, 10].

In poor resource countries, about 90% of school-age children were affected by dental caries as compared to the richest countries which accounted for 30% to 50% [7, 11]. A Systematic study finding showed that dental caries has been reported high in East African countries resembling Tanzania, Ethiopia, Sudan, and Eretria with a prevalence of 30.7%, 40.98%, 57.8%, and 65.2%, respectively [12]. A study report explains that the majority of communities found in low-income countries have poor perceptions regarding dental hygiene, and they had dental caries [13]. Furthermore, studies showed that, there are different contributing factors to incresaes dental caries, of thus parental oral health literacy, consumption of sugary tea and beverages, foods such as chocolates, biscuits, and candy, and lack of daily tooth brushing habits [13-17]. In this regard, WHO set strategies for the prevention of children's dental caries as routine utilizing by reducing sugary diet, and promoting oral health hygiene at school and their home. However; the burden of dental caries stayed a public health problem among school-age children [11].

Therefore, this study was to assess the effects of a sugary diet and beverages combined with a lack of teeth brushing on the prevalence of dental caries hence not well recognized in the study area. So, the study was done by using data from school-age children in Debark town within the community, and the findings have given information to policymakers, health care managers, health care workers, school leaders, and researchers.

## Methods

### Study design

A community-based cross-sectional study was conducted from March 1 to April 1, 2021, in Debark town, Amhara regional state, Northwest Ethiopia. Debark town is 830 km from the capital city, Addis Ababa, and between the South of 'Semen Mountain' or Ras Dejen [18].

The estimated total populations in the study area are 32,858. Of these, 14,011 are children below 15 years old. According to the administrative units, the town has 3 'kebeles' (smaller administer unit), and 4 'ketena' (smallest administration unit). Regarding the health services, there are one health center, two private medium clinics, four private primary clinics, six private pharmacies, and one general governmental hospital that serves the community and outside the area [19].

### Source and study population

The source population of our study was all parents paired with school-age children who have lived in Debark town, and the study population was all parents paired with school-age children who have lived greater than six months in Debark town and presented during the data collection period.

### Inclusion and exclusion criteria

Parents (mothers or fathers) who have school-age children the age 6-14 years old who lived in Debark town for more than six months were included. But children who had a cleft palate or cleft lip, critically ill were excluded from the study.

### Sample size determination

The sample size was calculated using single population proportion formula on the assumptions of 95% confidence level, 5% degree of precision, with different independent variables using the Statistical Package Epi-Info version 7.2.4. The largest sample size was taken from the proportion of dental caries 48.5% from the previous study conducted from "FinotSelam" [20].

$$n = \frac{(Z\alpha/2)^2 P(1-P)}{d^2}$$

Where: n: minimum sample size required for the study; d: margin of error =0.05% (5%); Za/2: the value of the standard normal distribution (z=1.96) with a confidence interval of 95%; P: the prevalence of dental caries taken from previous study 48.5%. n=(1.96)$^2$(0.485×0.515)/(0.05)$^2$=(3.8416)(0.249775/0.0025)=384. By using of design effect 1.5×384=576 and add-

ing of 10% non-respondent rate, the final sample size was 634.

*Sampling procedures*

A multistage random sampling technique was employed to select households. The town has three "kebeles" and each kebele has four ketena. We selected one kebele randomly using the lottery method. The proportional allocation was made for each ketena, and a simple random sampling technique was applied by using a frame of house numbers.

*Dependent variable*

Dental caries (Yes, No).

*Independent variables*

Age of parent and children, religion, sex of parent and children, ethnicity, marital status of parents socioeconomic status, educational status, educational grade of children, occupation of parents history of a dentist visit, consumption of soft drinks, consumption of sugared tea, use of health insurance, number of children in the family, consumption of sweet food, teeth brushing habit, family size, family monthly income, type of food used for breakfast, lunch & dinner.

*Operational definition*

*Dental caries:* Destruction of the outer surface of the tooth or the presence of at least one of the following; decayed teeth, missing teeth, cavity or hole teeth, filled teeth, with or without dental plaque on the tooth surface present with the oral examination [21, 22].

*Missing teeth*: An absence of teeth related to caries but not in trauma [23].

*Sweeten food consumption*: Frequent use of candies, chocolates, cakes, and drinking beverages containing sugar or packed juice.

*Tea and sweet food consumption frequency:* Children use sweet food more than three times per day considered a high frequency [24].

*Tea consumption*: Children use tea more than three times per day.

*Filled teeth*: Any device (plastic or metal) inserted into the cavitate teeth [23].

*Dental plaque:* A soft, sticky material that accumulates on the tooth through the action of bacteria and food debris [25].

*School-age children*: Children found within the age of 6-14 years.

*Data collection method and procedure*

Structured interview questionnaires and oral examination checklists were adapted from a reading of different kinds of literature and additionally used the WHO guideline to collect the data [11, 14, 15]. The questionnaires have three parts, socio-demographic characteristics, behavioral factors, and factors affecting dental caries. Four professional nurses were recruited and trained for data collection and one health officer was also recruited for supervision activities. The data we collected through face-to-face interviews and oral examination by trained data collectors.

*Data quality control*

To assure the data quality, the original English questionnaire was translated into the Amharic version and re-translated back to the English language to check its consistency. The recruited data collectors and supervisors were trained for two days on the objective, the confidentiality of information, relevance of the study and respondent's rights, informed consent, and techniques of interviews before going to collect the data. In addition, an observational oral examination checklist proof was assisted by the dental doctor. The reliability of the questionnaire was pretested among 32 (5%) samples in "Dabat town" before the actual data collection period, and to check the internal consistency, we were checked through "Cronbach's alpha test" using SPSS version 25 which scored 0.78 that lies in the cut of point. During the data collection period, the principal investigators and supervisors checked on the spot daily the collected data with data collectors.

*Data processing and analysis*

The collected data were cleaned, coded, and entered into Epi Data 3.2.1 software package

**Table 1.** Socio-demographic characteristics of the study participants in Debark town, Northwest, Ethiopia, 2021

| Variables | Categories | Frequency | Percentage |
|---|---|---|---|
| Sex of children | Male | 290 | 47.3% |
| | Female | 323 | 52.7% |
| Age of children | 6-10 | 375 | 61.2% |
| | 11-14 | 238 | 38.8% |
| School grade of children | K.G 1-3 | 111 | 18.1% |
| | Grade 1-2 | 186 | 30.4% |
| | Grade 3-4 | 147 | 24.05% |
| | Grade 5 & above | 169 | 27.6% |
| Respondents sex | Male | 175 | 28.5% |
| | Female | 438 | 71.5% |
| Age of Respondents | 25-34 years | 233 | 38% |
| | 35-44 years | 284 | 46.3% |
| | 45-72 years | 96 | 15.7% |
| Marital status | Single | 43 | 7.0% |
| | Married | 369 | 60.2% |
| | Divorced | 125 | 20.4% |
| | Widowed | 76 | 12.4% |
| Maternal Educational status | Illiterate | 156 | 25.4 |
| | Primary | 206 | 33.6 |
| | Secondary | 137 | 22.3 |
| | Collage & above | 114 | 18.6 |
| Father's Educational status | Illiterate | 86 | 14.0% |
| | Primary | 198 | 32.3% |
| | Secondary | 130 | 21.2% |
| | Collage & above | 199 | 32.5% |
| Maternal occupation | Housewife | 281 | 45.8% |
| | Marchant | 178 | 29.0% |
| | Governmental employee | 112 | 18.3% |
| | Non-Governmental employe | 22 | 3.6% |
| | Labor worker | 20 | 3.3% |
| Father's occupation | Unemployed | 40 | 6.5% |
| | Merchant | 96 | 15.7% |
| | Governmental employee | 213 | 34.7% |
| | Non-Governmental employe | 112 | 18.3% |
| No. of children | 1-2 | 31 | 13.3% |
| | 3-6 | 166 | 27.1% |
| | ≥ 7 | 366 | 59.8% |
| Ethnicity | Amhara | 585 | 95.4% |
| | Oromo | 3 | 0.5% |
| | Tigray | 9 | 1.5% |
| | Kimant | 16 | 2.6% |
| Religion | Orthodox | 382 | 62.3% |
| | Muslim | 224 | 36.5% |
| | Protestant | 7 | 1.1% |
| Family income | < 1958 ETB | 200 | 32.6% |
| | 1959-4609 ETB | 136 | 22.2% |
| | 4601-6179 ETB | 95 | 15.5% |
| | > 6180 ETB | 182 | 29.7% |

Note: KG-kingergarten, ETB-Ethiopian Birr.

**Table 2.** Behavioural factors of the study participants in Debark town, Northwest, Ethiopia, 2021

| Variables | categories | Frequency | Percentage |
|---|---|---|---|
| Habits of child brush | Yes | 354 | 57.7% |
| | No | 259 | 42.3% |
| The type of materials used for teeth brush | Toothpaste | 135 | 22.0% |
| | Sticks | 93 | 15.2% |
| | Charchol | 126 | 20.6% |
| | Never use | 259 | 42.3% |
| Children assisted by family for teeth brushing | yes | 136 | 22.2% |
| | No | 477 | 77.8% |
| Food used for Breakfast | Tea with bread | 306 | 49.9% |
| | Pasta with tea | 37 | 6.0% |
| | Egg with bread | 69 | 11.3% |
| | Milk with bread | 80 | 13.1% |
| | Enjera with "wot" | 121 | 19.7% |
| Food used for lunch | Tea with bread | 5 | 0.8% |
| | Pasta with tea | 165 | 26.9% |
| | Egg with bread | 68 | 11.1% |
| | Enjera with "wot" | 375 | 61.2% |
| Family follow their child's teeth condition | Yes | 457 | 74.6% |
| | No | 156 | 25.4% |
| The family gave sweeteners for their children | Yes | 413 | 67.4% |
| | No | 200 | 32.6% |
| Frequency of soft drink used/day | Not used | 285 | 46.5% |
| | Some times | 277 | 45.2% |
| | Once/day | 49 | 8.0% |
| | ≥ two/day | 2 | 0.4% |
| Frequency of sugary food consumption/day | Not used | 112 | 18.3% |
| | Some times | 246 | 40.1% |
| | Once/day | 135 | 22.0% |
| | Twice/day | 69 | 15.7% |
| | > three/day | 24 | 3.6% |
| Number of teeth-brushing/day | Not brush | 268 | 43.3% |
| | Sometimes/wk | 104 | 17.0% |
| | Twice/day | 52 | 8.5% |
| | Once/day | 124 | 20.2% |
| | Always after meal | 65 | 10.6% |
| Consult a dentist for a child's teeth | Yes | 113 | 18.4% |
| | No | 495 | 80.8% |
| Parents take their children when they had a tooth problem | To health institution | 406 | 66.2% |
| | Removed by cultural practice | 136 | 22.2% |
| | Gave cultural drugs | 45 | 7.3% |
| | Nothing did | 26 | 4.2% |
| Use of health insurance | Yes | 192 | 31.3% |
| | No | 421 | 68.7% |

and analyzed using Statistical Package for Social Sciences (SPSS) version 25. Descriptive statistics of the frequency with percentage were computed, and results were presented in texts, tables, and figures. A binary logistic regression model was used for analysis.

Bi-variable logistic regression was applied, and candidate variables with $p$-value < 0.2 entered multivariable logistic regression through the utilization of the backward stepwise method. Model fitness for appropriateness of the analysis was checked with the Hosmer-Lemeshow
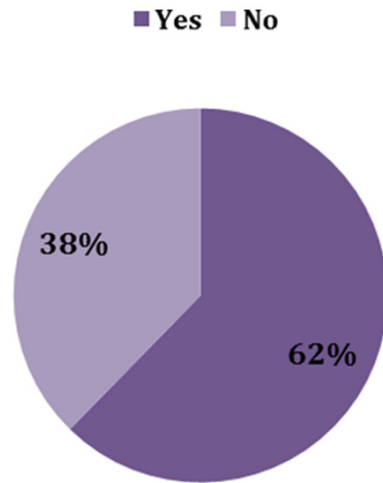
## Prevalence of dental carries

■ Yes ■ No



Figure 1. Prevalence of dental caries among school-age children in debark town, Northwest, Ethiopia, 2021.

test, and the *P* value 0.06. Considering the declared association between dental caries to independent variables, we used AOR with 95% CI, and *P* value < 0.05.

### Results

*Socio-demographic characteristics*

A total of 634 parents of children were enrolled, of whom 96.7% of response rate. The mean age of parents, and children was 37.74 (SD ± 8.205) and 9.94 (SD ± 2.4 years), respectively. The majority of respondents, 438 (71.5%) were child's mothers, among them, 201 (45.8%) were housewives. Regarding maternal and fathers' educational status, 33.6%, and 32.5% completed primary school, and college, respectively. Significant participant numbers, 95.4% were Amhara in ethnicity and, 381 (62.2%) were orthodox in religion (**Table 1**).

*Behavioral factors of the study participants*

In our study, half of the children, 306 (49.9%) used bread with tea for breakfast, 24 (3.9%) consumed sugary food more than three per day, and more than 40%, 268 (43.7%) did not brush their teeth (**Table 2**).

*The prevalence of dental caries*

In this study the prevalence of dental caries was 37.7% with 95% CI: (34.01-41.72) (**Figure 1**).

In this finding, among school-age children who had dental caries, 20.2% were females (**Figure 2**).

In the current finding, for children's dental assessment status, 19% had a dental lesion (**Figure 3**).

*Associated factors with dental caries*

Bi-variable and multivariable logistic regression analyses were done to determine the association between independent variables with children's dental caries. In a bi-variable logistic analysis, age of children, educational status of the mother, family health insurance, daily use of sugared tea, regular using sweet foods, and lack of teeth brushing habits were predictors' of children's dental caries. By adjusting the confounding variables in multivariable analysis age of children, educational status of the mother, family health insurance, daily use of sugared tea, regular use of sweet food, and lack of teeth brushing habits remained associated with dental caries.

In this study, the age of children increased and the likelihood of having dental caries was increased by 2.5 times compared to younger children [AOR=2.54, 95% CI: 1.73-3.73]. Children who have illiterate mothers were a 2.58 times higher chance of developing dental caries than mothers holding diplomas and above [AOR=2.58, 95% CI: 1.43-4.65]. Children apart from the family who have not used health insurance were 2.3 times more likely to develop dental carries as compared to their counterparts [AOR=2.38, 95% CI: 1.547-3.661], and the likely hood of dental carries was 5.7 times higher among children who ate frequently sweet foods compared to not eat [AOR=5.74, 95% CI: 1.973-16.708] (**Table 3**).

### Discussions

In developing countries like Ethiopia, dental carries have seen a significant burden on public health by incurring a high cost of health services and illness [26, 27]. In our study, the prevalence of dental caries was 37.7% with [95% CI: 34.01-41.72]. This is congruent with studies conducted in Gondar town 36.3% [28], Debre Berhan 34.1% [14], Harar 36.9% [29], and Kenya 37.5% [30]. This is due to the same socio-cultural practice, food habits, economical similarities, and health-seeking behavior. Whereas Kenya found that a developing coun-
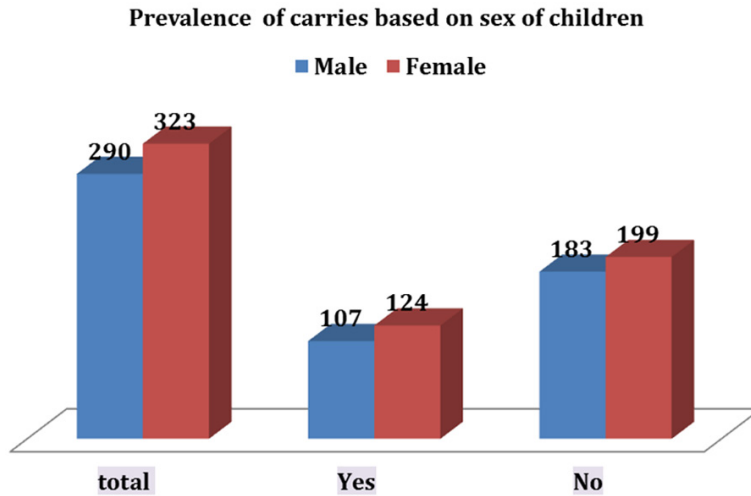
Prevalence of carries based on sex of children

**Male** **Female**



**Figure 2.** Prevalence of dental caries based on sex in children in Debark town 2021.

Dental status of school age children

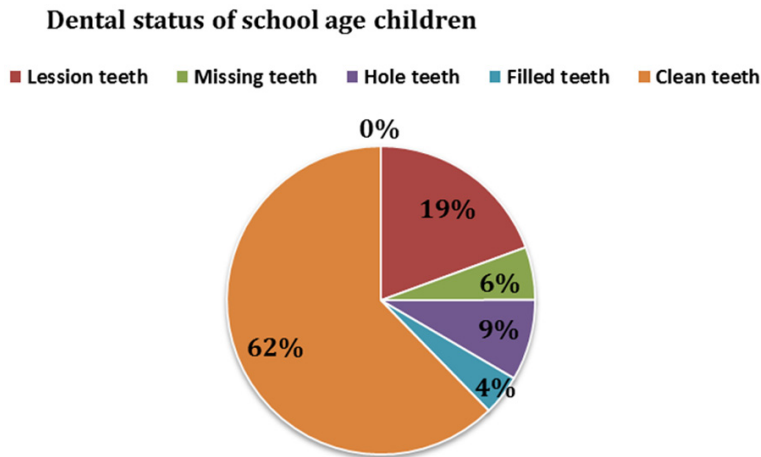**Lession teeth** **Missing teeth** **Hole teeth** **Filled teeth** **Clean teeth**



**Figure 3.** The status of children's teeth on dental assessment in Debark town 2021.

try has similarities to Ethiopia since population awareness of dental health care has been minimal.

The prevalence of our study is substantially higher than the research work done in Gondar 23.64% [31] and Bahirdar 21.8% [32]. This might be the fact that the difference in study setting which was an institutional and had small sample sizes. However, the current study done at community level which is a bit large sample size. In addition, the participants in the community had low oral health awareness in self-care practice.

Our study finding is lower than studies in Finote Selam (48.5%) [20], and Eritrea (78%) [33]. This

might be due to differences in the study setting and study population for instance Eritrea up to 12 years, and Finote Selam was 12-20 years. In addition, they used a small sample size; below 300 whereas the current study was conducted community-based with a representative sample hence, large samples are appropriate to summarized as the previous study.

The present study shows children who have been uneducated mothers were 2.58 times higher to develop dental caries than children who had mothers holding diplomas and above. This is supported by studies done in Gondar [28], Kenya [30], Egypt [34], and Middle East Africa [13]. The possible reason might be uneducated mothers may not have health care awareness due to being unable to read the health magazines, might not follow the health care workers' advice for child teeth prevention, or might be difficult to comprehend oral health care information.

The current study revealed that children who consumed sugary foods three or further per day were 5.7 times higher to develop dental caries compared to those who did not consume. This is supported by the previous studies conducted in Ethiopia in different locations, Finot Selam [20], Bahirdar [32], and Debre Berhan [35], and bordering countries like Kenya [30], Egypt [33], and the Far East country, Sudi Arabia [36] and, India [37]. This is the fact that children who loved a sugary diet if consumed frequently have developed dental caries [38]. Because a sugary diet affects the hard part of teeth in the action of bacteria to form dental plaque. As we recognized, sugared food and sweeteners are easily metabolized by salivary amylase, found in the oral cavity, thus producing a substrate favorable for oral bacteria to lower the ph of saliva and make dental caries [39].

**Table 3.** Bi-variable and multivariable analysis between children's dental caries and different independent variables in Northwest, Ethiopia, 2021

| Variables | | Dental caries | | COR with 95% CI | AOR 95% CI |
|---|---|---|---|---|---|
| | | Yes (%) | No | | |
| Children age | 6-10 years | 120 (32%) | 254 | 1 | 1 |
| | 11-14 years | 112 (47%) | 127 | 1.89 (1.35-2.64)* | 2.5 (1.73-3.73)** |
| Educational status of mothers | Illiterate mothers | 89 (57%) | 67 | 1.964 (1.2-3.207)* | 2.58 (1.43-4.65)** |
| | Primary | 40 (29.2%) | 97 | 1.77 (1.09-2.866) | 0.79 (0.46-1.38) |
| | Secondary | 137 (77.4%) | 40 | 1.64 (0.97-2.77) | 0.78 (0.44-1.38) |
| | ≥ diploma | 46 (40.3%) | 68 | 1 | 1 |
| Health insurance | Yes | 56 (29.2%) | 136 | 1 | 1 |
| | No | 176 (41.8%) | 245 | 1.75 (1.21-2.52)* | 2.4 (1.55-3.66)** |
| Daily use of tea | Yes | 166 (42%) | 230 | 1.16 (1.16-2.35)* | 1.8 (1.21-2.67)** |
| | No | 66 (30.4%) | 151 | 1 | 1 |
| Sweet food consumption Frequency | not used at all | 36 (32%) | 76 | 1 | 1 |
| | Sometimes | 73 (29.7%) | 173 | 0.89 (0.55-1.44) | 1.1 (0.62-1.77) |
| | once/day | 56 (41.5%) | 79 | 1.50 (0.89-2.53) | 1.6 (0.92-2.85) |
| | twice/day | 50 (52%) | 46 | 2.30 (1.31-1.03)* | 2.9 (1.55-5.47)** |
| | ≥ 3 time/day | 17 (63%) | 7 | 5.13 (1.95-13.5)* | 5.7 (1.97-16.71)** |
| Frequency of teeth brushing per day | Always after meal | 13 (20%) | 52 | 1 | 1 |
| | twice/day | 19 (36.5%) | 33 | 2.30 (1.01-5.30) | 2.1 (0.85-5.35) |
| | once/day | 44 (35.5%) | 80 | 2.20 (1.08-4.48)* | 2.5 (1.17-5.49)** |
| | Sometimes/week | 39 (37.5%) | 65 | 2.40 (1.16-4.96)* | 2.8 (1.25-6.04)** |
| | not brushing | 117 (43.7%) | 151 | 3.10 (1.6-5.96)* | 3.5 (1.68-7.07)** |

COR-Crowds odd ratio, AOR-adjusted odd ratio, CI-confidence interval, *variables associated in Crowds odd ratio, **variables associated in adjusted odds ratio.

The current findings show that older age children were 2.5 times more developed in dental carries than younger age. This is supported by studies conducted in Sudan [40], and the CDC reports [41] that 13% of adolescents aged 12 to 19 years have dental caries. The possible explanation might be that older children have been conditioned to buy and eat sweeteners in small shops as peer invitation, and might not take habitual action of oral hygiene which can develop dental caries. In addition, the family might not give attention since they believed as older children keep their hygiene by themselves [42].

This study shows that children's families who did not use health insurance were 2.3 times higher to develop dental caries compared with their counterparts. This is supported by evidence done in Canada [43] and Japan [44]. The possible reasons might be family have not health insurance may not afford the cost of health services and are delayed in treatment. Children who did not brush their teeth after a meal were 3.5 times more likely to develop dental caries than their counterparts. This is in line with studies done in Harar [29], Bahirdar [32],

Alem ketema [42], and Saudi Arabia [36]. This is the fact that poor oral hygiene is a habitat for bacteria growth and multiplication which leads to dental caries. Additionally, regular consumption of sweeteners and sugary diets together with an unhygienic oral cavity enhances the growth of microbes to cause dental plaques [45].

Children who drank sugared tea three and above were at 1.8 times higher risk of acquiring dental caries than their counterparts. A similar study was founded in Baher Dar, Debre Berhan [32, 35], Sudan, and Egypt [34, 40]. This is the fact that sugars are favorable media for bacterial growth in the oral cavity, in turn, dental caries.

### Conclusion

In this study, dental caries were found high among school-aged children in Debark town. Maternal educational status, family health insurance, frequent consumption of sweet foods, lack of habit of teeth brushing, and daily use of sugar tea were factors associated with dental caries. The authors recommended

addressing maternal supervision for the child's daily tooth brushing, minimizing the daily consumption of sugary tea and beverage, and using health insurance to afford dental care as a way to improve this population's oral health.

## Limitation

The current study was done with a self-reported face-to-face interview, and observational checklist data the data collectors were nurses who may be prone to social desirability bias. In addition, it was a cross-sectional study that cannot always determine the temporal relationship.

## Acknowledgements

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## Disclosure of conflict of interest

None.

## Ethical consideration

Ethical clearance had obtained from the school of nursing research ethical review committee in the Ref. No.nurs 336/03/2021. at the University of Gondar and further permission had obtained from Debark town Health Bureau, and each 'kebele' administrative body by describing the objectives of the study, then it was delivered to each 'ketena' administrator and the importance of the study was explained for each participant. Data had collected after full informed verbal consent and assents taken from parents and children before the interview and dental examination of children. Confidentialities the information was kept throughout the study by excluding names as identification in the questionnaire and maintained their privacy during interviewing and observation them alone. The collected data was secure in a locked cabinet. Participants who had dental caries during

the oral examination had links to the nearest health institution.

## Abbreviations

A. A, Addis Ababa; AOR, Adjusted Odd Ratio; COR, Crude Odd Ratio; CI, Confidence Interval; DC, Dental Caries; LMICS, lower-middle-income Countries; SPSS, Statistical Package for Social Sciences; WHO, World Health Organization.

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