

Prevalence of Dental Caries and Relation with Nutritional Status Among School-Age Children in Resource Limited Setting of Southern Ethiopia

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Research Article

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Abstract Background

Dental caries is a major public health problem globally and a widespread non -communicable disease. Dental caries is more prevalent in school-age children however there are few studies for relation of dental caries with nutritional status. Thus, this is aimed to determine the relation of dental caries with nutritional status among school-age children at Areka town Woliata zone from February 03 - February 22, 2020.

Methodology

: A community-based cross sectional study was conducted on systematic randomly selected 761 schoolage children (6-12years) of Areka town. Data were collected by face-to-face interviewer-administered questionnaire and clinical assessment of dental caries. Data were entered into Epi data 3.2.1 and exported to SPSS 20 for further analysis. Bivariate and multiple logistic regression analyses were used to identify the association of dependent and independent variables. P-value < 0.05 was considered to declare a result as statistically significant.

Results

Prevalence of dental caries among school-age children was 15.6% with (95% Cl, 13.0-18.5%). Nutritional status were 4.3% (95% Cl, 2.9-5.8%) of children were underweight and 14.2% (95% Cl, 11.7-16.6%) were overweight. The relationship between dental caries with nutritional status was not statistically significant with a p-value (p = 0.32). Factors associated with dental caries were educational status of a mother AOR 3.14, (95% Cl, 1.03-9.56), not cleaning teeth AOR 7.70, (95% Cl, 4.00-14.85), sugared coffee drinking AOR 3.22, (95% Cl, 1.68-6.18.0), sweet food consumption AOR 4.19,(95% Cl, 1.76-9.96) and non-consuming milk AOR 5.66,(95% Cl, 1.49-21.49).

Conclusion and recommendation:

Dental caries were low compared to WHO oral health reports of school-age children. Tooth cleaning habit, parental education, sweet food consumption and milk consumption are associated factors. Therefore, Behavioral intervention on dental hygiene and dietary practices are mandatory for school-age children.

Introduction

Oral health, as defined by World Health Organization (WHO), is a state of being free of mouth and facial pain, oral infection and sores, periodontal(gum) disease, tooth decay, tooth loss, and other diseases and disorders that limit an individual's capacity for biting/chewing, smiling, speaking, and psychosocial wellbeing (1). According to the 2017 Global Burden of Disease Study, dental caries of the primary teeth

affect more than 530 million children worldwide (2). Dental caries is a major public health problem globally and is the most widespread non-communicable disease (NCD) among school-age children. Global burden of disease (GBD) 2016 Study ranking first for decay of permanent teeth half of the world's population (3.58 billion people) and twelfth for deciduous teeth (560 million children) (3).

Most of the dental caries were untreated with considerable impacts on general health, quality of life, productivity, development, and educational performance (4). Having good oral health enables individuals to communicate effectively, to enjoy food, to speak well, to enjoy a higher quality of life, and to have both higher self-esteem and social confidence. Tooth infection causes pain and restlessness to children resulting in decreased growth hormone and increased metabolic rate so malnutrition in children can occur(5). School-age children (6-12yrs) are a top priority in oral health programs because of the high prevalence of dental caries and the development of permanent teeth in this age group (6).

The burden of dental caries in children is high. Dental caries will progress into tooth pulp and a dental abscess will form if untreated to end with loss of teeth. In advanced cases, it may interfere with dietary habits as a result affect nutritional status as well as affect sleep, work activities, and school attendance (7, 8).

Dental illnesses, particularly dental caries, cost the worldwide economy \$298 billion in direct treatment costs, accounting for 4.6 percent of global health expenditures (9, 10). Dental caries spend 5–10% of healthcare budgets in developed countries, and is one of the leading causes of child hospitalization in various high-income countries. Dental health is neglected in developing countries, this percentage is substantially lower. In developing countries, it is one of the most expensive diseases to treat (11).

Oral tissues require nourishment for development, growth, and maintenance, and oral problems can influence food choices and, ultimately, nutritional status. Prior to tooth eruption, nutritional deficiencies can affect enamel maturation and composition as well as tooth morphology and size (12–14). Undernutrition in children not only delays teeth development but also results a high number of carious primary teeth and exacerbates the carcinogenicity of dietary sugars. Tooth decay and early loss of teeth lead to under-nutrition (15).

WHO set a universal goal for developing countries achieved the year 2020 stated that about 50% of 6 year-old children should be free of decayed teeth and the average DMFT(Decayed Missed Filled teeth) score should not be more than 3 at the age of 12 years (1). Although, dental caries with nutritional status is bidirectional effect each other in school-age children. There are few studies the relation to dental caries with nutritional status among school-age children. Therefore, this study was carried out to determine the prevalence of dental caries in relation to nutritional status among school-age children.

Methods And Materials

Study setting, design and period

All method sections were done according to standard guidelines and procedures of observational methods. A community-based cross- sectional study design was conducted in Areka Town, Woliata zone, Southern Nations Nationality People region (SNNPR), Ethiopia in February 2020. Areka town is located in the northern part of Wolaita Zone and is found 299 km South of Addis Ababa, 178 km from the city of Hawassa, and 29 km from Sodo (zonal capital). The town is divided into 4 kebeles with 29 urban and 18 rural villages. According to Areka town health office 62,254 total populations and 12,805 households and 20,083 school-age children were calculated by an indicator given from Fedral ministry of Health (FMOH) for each region (32.26%) for Southern Nations Nationality People region (SNNPR) in 2010 (16).

Source population and Study population

Source population was all school-age children (6-12 years old) living in Areka town. The study population was selected school-age children living in Areka town during the study period.

Inclusion and exclusion criteria

All school-age children permanently residing in the selected household for at least 6 months and their caregivers were included. Severe medically ill, long-term medication, and undergoing orthodontic treatment school-age children were excluded.

Sample size determination

Sample size was calculated by single population proportion formula with an assumption of the prevalence of dental caries of 36.3% (17) at Gonder town. Other assumptions were 95% Confidence interval, 5% margin of error, 2 design effect, and 10% non-response rate. The total sample was **783** school-age children. N = $(Z_1-\alpha/2)^{2*}P^*(1-P)/d^2$

Sampling procedure

Sampling was systematic random sampling done from Areka town each Kebele. The sample size was proportionally allocated to all kebeles depending on their number of households. Sampling frame of Housholds with school-age children were prepared from health posts family folder. Finally, systematic random sampling method with k is 6th interval was applied to select the households with school-age children. The first households were selected from each kebeles by random method. If the selected the households have more than one eligible school-age child in the house, lottery method was used to select one eligible. When the child was not present at home, 3 visits were made and after 3 visits, they were recorded as non-response (Figure 1).

Data collection tool and procedures

Data were collected using interviewer administered questionnaire adopted from a review of literatures (17-20). School-age children with caregivers from the selected household were interviewed. . Ten BSc graduate nurses were data collectors and two masters of public health were supervisors. Both data

collectors and supervisors were able to speak the local language. Training was given for two days on how to collect data and supervise the data collectors. Supervisors were given additional training on oral examination of children. Also, the principal investigator was supervising during data collection.

Dental caries were assessed by clinical assessment of the oral. It was done by supervisors and principal investigator. Dental caries were measured by the sum of Decayed, Missing and Filled Teeth (DMFT). DMFT is a tool used for measuring the prevalence of dental caries. The "D" component means Decayed tooth, "M" component is the Missing tooth, "F" component is the Filled tooth and "T" is the Tooth involved. A DMFT score above 0 indicates the presence of caries, whereas a null score indicates the absence of caries. The severity of dental caries were classified based on WHO using DMFT values, values between 0.0 - 1.1 very low; 1.2 - 2.6 low; 2.7 - 4.4 moderate; 4.5 - 6.5 high; values exceeding 6.6 will be very high (3).

Nutritional status of children was assessed by measuring height and weight. Height was recorded with the help of a height board. Weight was measured using a digital weighing scale after calibration is done. BMI score was compared to the WHO reference 2007 chart for age 5–18 years and assessed by using age and gender specific criteria. The following were assessed using BAZ Underweight as BAZ <-2SD, normal ≥ -2 SD to $\leq +1$ SD and overweight/ obesity as BAZ > +1SD (21).

Food consumption patterns were assessed using an unquantified interviewer-administered food frequency questionnaire. It was investigated by seven-day food frequency questionnaire (FFQ) consisting of 12 listed food items which are commonly used by the study population and are rich with micronutrients of interest (Calcium, Vitamin C & D), were read out to the respondents who were to state the number of times they had consumed the foods in the past 7 days.

Study variables

Dependent variable

• Dental caries

Independent variables

- Nutritional status: underweight, normal, overweight and obesity.
- Socio economic and demographic variables: age, sex, residence, grade level, parent's education, monthly income of the family and Television ownership.
- **Dietary habits of children:** sweet consumption, meal frequency, Fruit consumption and diary product consumption.
- **Oral health related behaviors:** teeth brushing, mouth rinsing, dental plaque, toothache, dental clinic visit and flossing habit.

Operational definitions

- DMFT: Decayed (D), presence of a lesion in a pit or fissure or on smooth tooth surface had a detectable softened floor, destabilized enamel or softened wall. Missing (M), because of caries if a person gave a history of pain and/or presence of cavity prior to extraction. Filled (F) presence of one or more restorations.
- **Dental Caries:** A DMFT score above 0 indicates the presence of caries, whereas a null score indicates the absence of caries.
- **Regular tooth brushing-** reported of brushing tooth with toothbrush and fluoride toothpaste twice a day or after every meal for about two minutes.
- **Flossing habit-** is removing of food and dental plaque from space between two teeth areas a toothbrush is unable to reach.

Data quality assurance

Questionnaires was first prepared by English language. It was translated to local language Wolayituma by local and English language experts. It was back translated to English by different language expert to maintain its consistency. Pre-test was conducted on 5% of school-age children in Bombe town outside study area after training given. This was verifying the clarity of instruments and helps to familiarize data collectors to the instrument and necessary correction was made accordingly. The supervisors and the principal investigator made daily checkup on the data collection process to ensure the completeness and consistency of gathered information. Any error found during the process was corrected immediately.

Data management and analysis procedures

Data were entered into Epi data version 3.2.1 after ensuring completeness of each questionnaire, then exported to SPSS version 20 for further analyses. Descriptive statistics were conducted to determine the frequencies and percentages of different variables. Bivariate and multiple logistic regression analyses were done to identify variables that were associated with the dependent variables. Independent variables having P-value less than 0.25 on bivariate analysis were the candidate for multiple logistic regression analyses of fit test was used to assess the fitness of the model during multiple logistic regression analyses. Normality was checked by Kolmogorov smirnov test of normality.

Crude and adjusted odds ratios together with their corresponding 95% confidence intervals were computed and interpreted accordingly. P-value <0.05 was considered to declare a result as statistically significant. A correlational statistical test was used to determine the relation between nutritional status and caries occurrence. BMI- for-age (BAZ) was used to assess each child's nutritional status. BMI- for-age (BAZ) score parameter was calculated using WHO anthroplus 2007 version 3.2.2 software.

Result

Socio demographic characteristics of respondents

A total of 761 participants were included in the analysis, resulting in a response rate of 97.2%. Three hundred thirty-one (43.5%) school-aged children were between the ages of 6 and 8 years, with a median age of 9.0 and an interquartile range (IQR) of 4, and 54 percent of them were girls. Most of the respondents, 723 (95%) were urban residents. Five hundred twelve (67.3%) of them are attending class at governmental school and they are 0–4 class students. Two hundred forty-four (32.1%) mothers or caregivers had no formal education and 308(40.5%) of fathers were College and above. Above half of (52.7%), mothers or caregivers occupation was housewife and 296 (38.9%) fathers were government employee. The majority of the households 505 (66.4%) had television (Table 1).

Table 1 Frequency distributions of socio-demographic characteristics of children at Areka town, Woliata zone 2020 (n = 761)

Variables		Frequency	Percentages (%)
Residence	Urban	723	95
	Rural	38	5
Sex	Male	350	46
	Female	411	54
Age (years)	6-8	331	43.5
	9–10	218	28.6
	11-12	212	27.9
School type	Governmental	512	67.3
	Private	249	32.7
Grade level of child	0-4	644	84.6
	5-8	117	15.4
Educational status of mother	No formal education	244	32.1
	Primary education	192	25.2
	Secondary education	212	27.9
	College and above	113	14.8
Educational status of father	No formal education	83	10.9
	Primary education	89	11.7
	Secondary education	281	36.9
	College and above	308	40.5
Occupation of the mother	Employee	108	14.2
	House wife	401	52.7
	Merchant	248	32.6
	Other	4	0.5
Occupation of the father	Government Employee	296	38.9
	Merchant	296	38.9

* = Gurage, Siltte, Amhara **= Catholic

Variables		Frequency	Percentages (%)
	Farmer	48	6.3
	Laborer	112	14.7
	Other	9	1.2
TV ownership	Yes	505	66.4
	No	256	33.6
Time on TV screen per day (n = 505)	1-2hours	226	43.4
	>2hours	295	56.6
* = Gurage, Siltte, Amhara **= Catholi	С		

Oral health-related behaviors of children

The majority of the children, (72.5%), never clean their teeth; of those who do, 416 (75.3%) clean their teeth once or less than once a day, while just 136 (24.7%) clean them on a regular basis. Two hundred and forty-nine children (45.1%) used mouthwash/rinse with water, whereas 209 people (37.9%) used paste-based toothbrushes. Almost half 288 (52.2%) clean their teeth the morning before breakfast. Two hundred seventeen (39.3%) children spent only one minute on teeth cleaning. Almost all 372 (96.1%) of the children who had a flossing habit used a conventional tool, and 193 (49.9%) flossed when something entered their teeth. Majority of the participant 467(61.4%) don't know when to renew toothbrush. The majority of them (92.6%) have never visited a dental clinic, and of those who have, the majority went for emergency dental pain treatment 52 (41.4%) and extraction 5 (8.6%). (Table 2).

Variables		Frequency (n = 761)	Percentages (%)
Ever cleaning teeth (n = 761)	Yes	552	72.5
	No	209	27.5
Frequency of teeth cleaning in a day (n	\leq 1 daily	416	75.3
- 552)	\geq 2 daily	136	24.7
Way of cleaning teeth (n = 552)	Toothbrush with paste	209	37.9
	Toothbrush without paste	24	4.3
	Mouthwash / rinse with water	249	45.1
	Mefakia (twig brush)	70	12.7
Time of tooth cleaning (n = 552)	Morning before breakfast	288	52.2
	Morning after breakfast	138	25
	Noon before lunch	10	1.8
	After each feeding	13	2.4
	Whenever remember	74	13.4
	When think teeth is dirty	26	4.7
	Others	3	0.5
Time spent teeth cleaning (n = 552)	Less than one minute	153	27.7
	One minute	217	39.3
	Two minutes	121	21.9
	More than two minutes	61	11.1
Flossing practice (n = 761)	Yes	387	50.9
	No	374	49.1
Tools use for flossing (n = 387)	Professional	15	3.9
	Traditional	372	96.1
Time of flossing (n = 378)	Regularly	64	16.5

Table 2	
Oral health-related behaviors of children at Areka town. Woliata	zone 2020

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Variables		Frequency (n = 761)	Percentages (%)
	Something enters in to teeth	193	49.9
	When feel should	130	33.6
Time of toothbrush renewed (n = 294)	Every 3month	182	61.9
	Every 6month	76	25.9
	Every 1year	32	10.9
	Other	4	1.4
Tooth cleaning helps in preventing $(n = 761)$	Yes	640	84.1
calles (II – 701)	No	68	8.9
	Don't know	53	7.0
Dental clinic visit during the past 1year (n = 761)	Yes	58	7.6
	No	703	92.6
Frequency of dental visit (n = 58)	Regularly every 6–12 months	3	5.2
	Occasionally	31	53.4
	When have dental pain	24	41.4
Reason for visiting dentist (n = 58)	Dental pain	52	89.6
	For extraction	5	8.6
	For tooth cleaning	1	1.73
Dental pain/toothache history (n = 761)	Yes	55	7.2
	No	706	92.8

Dietary habits of children

More than three forth of the children 590 (77.5%) drank tea with sugar. Two hundred twenty-one (29%) of the children drank coffee with sugar. Forty one percent (319) of the children drank soft drinks and two third of the children 553 (70%) used to consume sweet foods. Among the sweet food consumers, 272 (51.0%) took less than once per week and 141(26.5%) daily. Five hundred sixty-five (74.2%) of the children consume milk less than once per week (Table 3).

Table 3	
Dietary habits of the children at Areka town, Woliata zone 20)20

Variables	·	Frequency (n = 761)	Percentages (%)
Consumption of sugared tea	Yes	590	77.5
	No	171	22.5
Number of cups of sugared tea per day $(n - 500)$	1-2	562	95.3
(1 - 390)	>2	28	4.7
Consumption of sugared coffee	Yes	221	29
	No	540	71
Consumption of soft drinks	Yes	319	41.9
	No	442	58.1
Number of bottles of soft drink per day	1-2	290	90.9
	>2	29	9.1
Consumption of sweet foods	Yes	553	70
	No	228	30
Frequency of sweet foods per month (n	Daily	141	26.5
- 555)	2-3days in a week	98	18.4
	Once a week	22	4.1
	Less than once per week	272	51
Consumption of milk per month	No, do not	47	6.2
	Less than once per week	565	74.2
	Usually /daily to weekly/	149	19.6

Consumption frequency of selected foods in the last 7 days

The highest percentage among leafy green vegetables, banana, wheat, and maize to be taken at least once in the last seven days with a frequency rate of 759(99.7%), 756(99.3%), 31(96.1%), and 727 (95.5%) respectively. It shows abundant consumption of vitamin C whereas fish and fish oil, meat and orange had been consumed at least once by 24 (3.2%), 370 (40.9%) and 460 (60.4%) respectively and these are the lowest percentage observed and shows lacks calcium and vitamin D (Table 4).

Table 4
Consumption frequency of selected foods in the 7 days preceding
the study of the children in Areka town, wonata zone 2020

Variable	Categories	Frequency	Percentage
Milk and milk product	Yes	699	91.9
	No	62	8.1
Fish and fish oil	Yes	24	3.2
	No	737	96.8
Meat	Yes	370	40.9
	No	391	59.1
Egg	Yes	661	86.9
	No	100	13.1
Leafy green vegetable	Yes	759	99.7
	No	2	0.3
Banana	Yes	756	99.3
	No	5	0.7
Orange	Yes	460	60.4
	No	301	39.6
Beans	Yes	702	92.2
	No	59	7.8
Peas	Yes	648	85.2
	No	113	14.8
Maize	Yes	727	95.5
	No	34	4.5
Barly	Yes	499	65.6
	No	262	34.4
Wheat	Yes	731	96.1
	No	30	3.9

Nutritional status and prevalence of dental caries

The median height and weight were 130.00cm with IQR 16.00 and 29.00kg with IQR 9 respectively. Among all children, 33 (4.3%) were underweight based on BAZ (< -2 SD) with (95% CI: 2.9–5.8), 620 (81.5%) were within the normal range (≥ -2 SD and $\leq +1$ SD) with (95% CI: 78.7–84.4) and 108 (14.2%) were overweight/obese (>+1 SD) with (95% CI: 11.7.0-16.6). The median score of BAZ was 0.37 with an IQR of 1.14.

Dental Caries prevalence was 119(15.6%) with (95% CI: 13.0-18.5). The prevalence is almost equally distributed among males 53(15.1%) and females 66(16.1%). DMFT score ranged from 0 to 8 and the mean DMFT was 0.27 (± 0.75). The prevalence of dental caries was higher in underweight and overweight children 21.2% and 18.5% respectively and lowers in children with normal weight 14.8% it was checked by the chi-square test and was statistically not significant (Table 5).

BAZ	Caries	s free	Carie	s active	Total	
	No	Percent	No	Percent	No	Percent
underweight	26	78.8	7	21.2	33	4.3
Normal	528	85.2	92	14.8	620	81.5
Overweight/obese	88	81.5	20	18.5	108	14.2
Total	642	84.4	119	15.6	761	100

Relationship Of Dental Caries With Nutritional Status

The relationship between dental caries with nutritional status was not statistically significant with a p-value (p = 0.32). The DMFT score was positively correlated to BAZ score but the relationships were not shown strong relationship with correlation coefficient value(r = 0.011).

Factors Associated With Dental Caries

Residence, school type, educational status of the mother,, time spent on Television, cleaning teeth, consumption of sugared coffee, sweet foods consumption, and milk consumption were candidate variables for multiple logistic analysis at p-value < 0.25. The multiple logistic regression analysis revealed the educational status of the mother, cleaning teeth, sugared coffee consumption, sweet foods consumption, and milk consumption had a statistical association.

Dental caries among children whose mother non-educated were 3.14 times (95% Cl 1.03–9.56) high risk compared to educated college and above. Children who did not clean their teeth were 7.70 times more likely to have caries as compared to those who had cleaned their teeth (AOR = 7.70, 95% Cl, 4.00-14.85).

Children who had not to consumed sugared coffee were 3.22 times reduced to have caries as compared to those who consume sugared coffee (AOR = 3.22, 95% Cl, 1.68-6.18). Children who had to consumed sweet foods usually were 4.19 times at high risk compared to those who had not consumed sweet foods (AOR = 4.19, 95% Cl, 1.76-9.96). Children who had not to consumed milk usually were 5.66 times more likely to have dental caries than those who had consume milk usually (AOR = 5.66, 95% C I = 1.49-21.49). There was no statistically significant association between dental caries and nutritional status of the children (Table 6).

Table 6 Multiple Logistic Regression Analysis for Factors Associated with dental caries in Areka town, Woliata zone 2020

Variables	With dental caries	Dental Caries free	COR	AOR
Educational status of m	other			
No formal education	49(20.1%)	195(79.9%)	5.42(2.10- 14.03)	3.14(1.03-9.56) *
Primary education	36(18.8%)	156(81.2%)	4.98(1.89- 13.11)	2.67(0.84-8.50)
Secondary education	29(13.7%)	183(86.3%)	3.42(1.28- 9.10)	2.30(0.78-6.77)
College and above	5(4.4%)	108(95.6%)	1	1
Cleaning teeth				
Yes	50(9.1%)	502(90.9%)	1	1
No	69(33.0%)	140(79.6%)	4.94(3.28- 7.45)	7.70(4.00-14.85) ***
Sugared coffee consum	ption			
Yes	45(20.4%)	176(55.2%)	1.61(1.7-2.42)	3.22(1.68-6.18) ***
No	74(13.7%)	466(86.3%)	1	1
Sweet foods consumpti	on			
Yes	100(18.8%)	433(81.2%)	2.54(1.51- 4.26)	4.19(1.76-9.96) ***
No	19(8.3%)	209(91.7%)	1	1
Milk consumption				
Don't consume	15(31.9%)	32(68.1%)		5.66(1.49-21.49) **
Occasionally	84(14.9%)	481(85.1%)		1.27(0.60-2.71)
Usually (daily to weekly)	20(13.4%)	129(86.6%)	1	1
Nutritional status				
underweight	7(21.2%)	26(78.8%)	1	1
Normal	92(14.8%)	528(85.2%)	0.64(0.27- 1.53)	0.43(0.12-1.48)

Variables	With dental caries	Dental Caries free	COR	AOR
Overweight/obese	20(18.5%)	88(81.5%)	0.84(0.32- 2.21)	1.02(0.26-4.00)

*=P < 0.05, **=P < 0.01, ***=P < 0.001

Discussion

The prevalence of dental caries was found 15.6% in line with the study conducted in Bahir Dar city, Ethiopia (21.8%) (18), Tanzania (17.6%)(22), and Nigeria (21.7%) (23). However, it was lower than studies carried out in other parts of Ethiopia (36.3%-48.5%) (17–20), Eritrea (78%) (24), and India(76.25%)(25). It was also much lower than WHO oral health reports of school children (60–90%) (7). These different prevalence figures could be due to socio-demographic and economic characteristics, and dietary behaviors. This might be also 95% of the study participants were from urban residence.

The relationship between dental caries with nutritional status was not statistically significant. The DMFT score was positively correlated with the BAZ score but these relationships were not statistically significant. Dental caries was associated with the educational status of the mother, cleaning teeth, sugared coffee consumption, sweet consumption, and milk consumption.

Educational status of the children's mothers were found to be significantly associated with dental caries. Hence, as the education level of the mother increases the probability of dental caries getting reduced. This was supported by similar findings from other parts of Ethiopia (17, 19). It might be the fact that mothers who were educated are more likely to gain knowledge about dental health and as general health of the child. It also gives an opportunity to have increased access to information from different Media.

Dental caries development and teeth brushing practices had a significant association. The more brushing of teeth is performed the less chance of caries development in children. This is in line with the study done in different parts of Ethiopia; Bahir Dar, Gonder, Adiss Abeba, and Finote Selam (17–20). This finding is also in line with the study conducted in Tamil Nadu India (26). It is generally true that cleaning teeth will remove away the food debris from the oral cavity. Therefore, Streptococcus mutans cannot get enough nutrients and time for growth and no acid production that causes dental caries development.

In this study, those children who had consumed sugared coffee increased the chance of developing caries than those who had not consumed. Sweet consumption was also significantly associated with dental caries. Children who consumed more sweet foods frequently had a higher chance of developing dental caries than those who consumed sweet foods rarely. This is supported by a study done in Adiss Abeba, Finote Selam, and Harar town (19, 20, 27). It is also in line with a study done in Mbeya City, Tanzania (22). This might be related to much acid production by microorganisms like bacteria to teeth because of fermentation of the sweet foods. Gradually the enamel of the tooth went into dental caries (28).

Children consuming milk usually were 5.66 times protective from dental caries than those children not consuming milk. It might be Cow milk had small amount of fluoride concentration and was similar to other studies(29).

Nutritional status (BAZ) and dental caries development was not significantly associated. This is in line with a study done in India(14). Dental caries is a multifactorial disease with several identified risk factors however the correlation between dental caries and nutritional status is not well understood requires further experimental research.

Difficulties in using radiological examination at the field level might reduce the actual magnitude of dental caries was the limitation of the study.

Conclusion and Recommendations

Prevalence of dental caries was found to be low compared to the WHO oral health reports of school children. The educational status of mother, cleaning teeth, sugared coffee consumption, sweet food consumption, and milk consumption were the associated factors for dental caries. There was no significant association between dental caries and nutritional status. Behavioral intervention on dental hygiene and dietary habits should be given to children and parents. Moreover, further studies using all methods of diagnosis of dental caries and assessment of knowledge, attitude, and practices of children and their parents on dental hygiene should be recommended.

Abbreviations

AOR- Adjusted Odds Ratio BAZ- BMI for Age Z score BMI – Body Mass Index CI- confidence Interval DMFT-Decayed Missed Filled teeth IQR- Interquartile range GBD- Global burden of disease NCD- non communicable disease SD- standard deviation

Declarations

Ethical approval and consent to participate: Ethical approval was obtained from the Wolaita Sodo University, college of health sciences and Medicine Institutional Review Committee (IRC). The official letter of cooperation was given to Areka town Health Office. Data collectors had explained the objective, benefit and risks of the study to get informed written consent for mothers or caregivers of the children. The right of the respondent to withdraw from the interview or not to participate was respected. Identification of an informant was possible only through specific identification numbers. Data collectors gave advice to mothers or caregivers of the undernourished child to provide additional balanced diets for their children and to visit the nearby health facility. All method sections were done according to standard guidelines and procedures of observational methods.

Consent for Publication: not applicable.

Availability of Data and Material: The datasets generated and/or analyzed during the current study are not publicly available due to ethical issues but are available from the corresponding author on reasonable request.

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Competing interest: the authors declared that they have no conflict of interest.

Author's contribution: SB: Initiated the research, wrote the research proposal, conducted the research, did data entry and analysis and wrote the manuscript. **SBW:** Involved in the write up of methodology of proposal and research work, analysis and manuscript write up. **YK**: Contributed in the write up of proposal and write up of the manuscript. **DW**: participated in the write up of methodology of proposal, research work and write up of the manuscript. All are equally contributed.

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Figures



Figure 1

Sampling Schematic diagram showing sampling procedure for Areka town, 2020