ORIGINAL RESEARCH

Determinants of Dental Health Problems Among Adult Patients at Dental Clinic, Debre Berhan Comprehensive Specialized Hospital, Ethiopia: Unmatched Case–Control Study

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Purpose: This study was aimed to assess the determinants of dental health problems among adult patients at the dental clinic of Debre Berhan Comprehensive Specialized Hospital, Ethiopia.

Methods: A case–control study was conducted to recruit a total of 267 adults (cases = 134, and controls = 133) who received oral health screening service in Debre Berhan Comprehensive Specialized Hospital, 2018. Data were collected by physical examination and pretested semi-structured questionnaire from March 1 to 31, 2018. Collected data were entered in EpiData 3.1 and analyzed by using SPSS version 20. Bivariable and multivariable logistic regressions were done via the forward stepwise method. Variables were declared statistically significant when p-value <0.05.

Results: Of the total study participants, 75 (55%) of cases and 62 (46.6%) of controls were males. The mean age (± SD) of cases was 36.2 (± 14.2) years and that of controls was 31.4 (± 10.3) years. The classification table revealed that the sensitivity of cases was 70.7%, and the specificity of controls was 74.8%. This study showed that 28 (20.89%) of cases and 6 (4.5%) of controls had confirmed gastritis (P < 0.05). Regarding dental health information, 78 (58.2%) of cases and 123 (92.5%) of controls perceived that they had received dental health information from different sources. Access to dental health information and tooth brushing practice reduced dental health problems (adjusted odds ratio (AOR) = 0.28; 95% CI: 0.12, 0.64; and AOR = 0.24; 95% CI: 0.13, 0.45), respectively, whereas study participants who had gastritis were at increased risk of developing dental health problems (AOR = 3.12; 95% CI: 1.14, 8.57).

Interpretation: Study participants who had adequate information on dental health had a reduced risk of developing dental health problems by 72% and participants who practiced tooth brushing were at reduced risk of developing dental health problems by 76%. However, individuals who had gastritis were 3 times more likely to develop dental health problems compared with their counterparts.

Conclusion: In summary, health information, tooth brushing practice, and gastritis infection were the determinants of dental health problems. Thus, health information dissemination on dental health particularly on how to prevent and control dental health problems is very critical. Moreover, strategies to combat gastritis integrated with life course principles should be strengthened to improve dental health.

Keywords: dental health, Ethiopia, gastritis, health information, tooth brushing

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Introduction

The World Health Organization (WHO) defines oral health as

a state of being free from mouth and facial pain, oral and throat cancer, oral infection and sores, periodontal disease, tooth decay, tooth loss, and other diseases and disorders that limit an individual's capacity in biting, chewing, smiling, speaking, psychosocial wellbeing, ability to communicate and self-esteem.

A healthy and well-functioning dentition is important during all stages of life since it supports essential human functions.[1] There are many forms of oral disease with different signs and symptoms, which are either preventable or treatable in their early stages: tooth decay and cavities, gum diseases, oral cancers, noma, oral manifestations of HIV and AIDS, orofacial trauma from accidents, and violence, cleft lip and palate that affects their ability to speak, to eat and to take part in all the routines of normal life.[2] Poor hygiene, genetic factors, stress, knowledge, attitude, systemic diseases such as diabetes, cardiovascular diseases, adverse pregnancy outcomes, and respiratory diseases are some of the important risk factors for oral disease.[1,3,4] Other important factors could be age, sex, income, educational status, gastric infection, diabetes mellitus, oral health literacy, and tooth cleaning.[5–10]

In 2020, the promotion of self-care is one of WHO's goals to improve oral health of the populations. These include tooth brushing more than once a day, lesser consumption of sugar-containing snacks, and regular use of fluoride-containing toothpaste. Studies have shown that there is an association between increased knowledge regarding oral hygiene and better oral health.[11] Conversely, the majority of the people are unaware of the relationship between oral hygiene and systemic diseases. Many diseases show their first appearance through oral signs and symptoms and they remain unchanged or untreated because of the lack of knowledge, attitude, and practice on oral hygiene.[12] For instance, proper tooth brushing practice prevents the development of dental health problems and has an effect on the quality of life and general health of people.[13] Moreover, dental check-ups twice a year, creating awareness to the public, prevent systemic diseases are helpful for the prevention and control of dental health problems.[14,15]

According to the global burden of oral health conditions, the number of people with untreated oral conditions rose from 2.5 billion in 1990 to 3.5 billion in 2015, indicating oral health problems are highly prevalent in the globe, and posing a very serious public health

challenge to policymakers.[16] Even though fluorides in the form of toothpaste, and/or fluoridated water, mouth rinses, and clinical topical fluorides have benefits, populations in many developing countries do not have access to fluorides for practical or economic reasons.[3] This in turn affects individuals to talk, eat and socialize without experiencing active disease, discomfort, or embarrassment.[17] Even if a dental health problem is a major public health concern, the knowledge, attitude, and practice towards the prevention measure is yet not at a level of preventing the burden. For example, knowledge of the dental problems in Kuching was estimated as 56.5%,[18] in Kenya 43% of the participants did not know any causes of dental diseases, and 50% did not know any preventive measures for dental diseases.[19] Similarly, a study done in Addis Ababa, Ethiopia, showed 28.8% of the respondents have knowledge of the correct techniques of tooth brushing.[13] In Nigeria, 72.5% and 26% of the teachers had a negative attitude and poor practice of oral health, respectively.[17] Therefore, this study was aimed at determining the factors associated with dental health problems among adult patients in Debre Berhan Comprehensive Specialized Hospital. Since identifying determinants is very crucial to generate evidence that help to prevent, control, and reduce dental health problems. Moreover, this study is expected to fill the gaps in the scarcity of evidence on this particular area.

Methodology
Study Area and Period
The study was conducted at Debre Berhan Comprehensive Specialized Hospital (DBCSH), located at about 130km away from Addis Ababa, in Debre Berhan Town, North Shoa Zone, Amhara, Ethiopia. The average annual temperature of the town during day and nighttime is estimated as 20.7°C and 8.2°C, respectively. The hospital was established in 1928 and serves for about 1.2 million people in its catchment area. This hospital serves for an average of 400–450 patients daily through both direct and referral systems. There are a total of 152 beds for inpatient service and provides preventive, curative, and rehabilitative services. The study was conducted from March 1 to 31, 2018.[20]

Study Design
Institution-based, unmatched case–control study was conducted to assess the determinants of dental health

problems among adult patients at DBRH dental clinic from March 1 to 31, 2018.

$$n = (\frac{r + 1}{r}) \frac{(\bar{p})(1 - \bar{p})(Z_\beta + Z_{\alpha/2})^2}{(p_1 - p_2)^2} \qquad \text{(i)}$$

Study Participants Selection

Patients who came to DBCSH dental clinic for diagnosis and treatment in the month of March 2018 were the study population for cases and those patients at DBCSH other than dental clinic and free from dental health problems were the study population for the controls. Selection of cases and controls were performed by intern medical doctors and senior dentists working in the dental clinic. All patients whose age is greater than 18, had dental health problems, and came to dental clinic, during data collection time were included in the study until the number of cases reached. On the other hand, controls were selected from DBCSH who were free from dental health problems as confirmed by the dentist. Those patients who are severely ill during the data collection time were excluded from the study.

Examination of Dental and Oral Health Problems

A dental doctor at a dental clinic outpatient department (OPD) examines dental and oral health problems by closely inspecting patients' teeth, mouth, throat, tongue, cheeks, jaws, and neck. If they get tooth decay, inflammation of the gums, infection of jaws and bones, cracked or broken teeth, and sensitive teeth based on the World Health Organization (WHO) protocol.[21] After the clinical dental examination, data collectors administered the exit questionnaire. These patients were considered as cases.[2]

Sample Size Determination and Technique

The sample size of this study was determined by using the formula indicated in equation (1), considering the following assumptions. Two-sided confidence level (95%), power (80%), the ratio of controls to cases (1:1), percentage of controls exposed (77.6%), Odds Ratio (OR = 0.42) for teeth brushing practice, and percentage of cases with exposure (59.3%).[5] Thus, 111 cases and 111 controls were taken to make the total sample size 222. Finally, adding 20% of the non-response rate, the total study participants calculated was 267. A consecutive sampling technique was used to select cases until sample size was reached, whereas a convenient sampling technique was used to select the controls from the same hospital who visited the facility for other than a dental problems.

Data Collection Tool, Procedure, and Quality Control

To measure the dependent and independent variables, two types of approaches were used; questionnaire and dental examination. Dental examination was performed by examining the patient to identify the following dental health problems; sores, or tender areas in the mouth that will not heal after a week or 2, bleeding or swollen gums after brushing or flossing, chronic bad breath, sudden sensitivity to hot and cold temperatures or beverages, pain or toothache, loose tooth, receding gums, and pain with chewing or biting.[22] To measure other determinants of dental health problems, a semi-structured interviewer-administered questionnaire was designed for this particular study. The tool was composed of closed-ended and open-ended questions consisting of five sections. These were 1) the socio-demographic section (7 items), 2) knowledge assessing questions (19 items), 3) attitude assessing questions (5 items), 4) dental health practice assessing questions (16 items), and 5) questions assessing the behavioural factors (10 items). The questionnaire was prepared first in the English language then translated into the local language (Amharic) then back to the English language to check the consistency (Supplementary Materials). The content validity of the translated questionnaire was evaluated by public health experts, a dental doctor, and medical doctors who are fluent in the local language. Based on their endorsements, modifications to the survey tool were made. Generally, the tool tried to assess study participants' socio-demographic background, knowledge, attitude, the practice of patients for dental health, and other risk factors including comorbidities. Data collectors and supervisors were trained about the objectives of the study, and how to collect data from clients visiting the dental clinic. Before actual data collection, a pretest was done on 5% of the sample size, and these data were excluded from the final analysis. The reliability analysis was done by using Cronbach's alpha test (Cronbach's alpha for knowledge = 0.45 and Cronbach's alpha for attitude = 0.35).

Operational Definition

Dentists: They are the principal providers of oral disease treatment and prevention. Their role is changing in response to emerging risk factors, evolving disease

burdens, demographic changes, and broader health system and socioeconomic pressures.

Sodium-fluoride: It is part of the WHO model list of essential medicine, and access to fluorides has been recognized as a part of the basic human right to health.

Poor dental knowledge: Study participants who scored less than the median value of overall knowledge score calculated from the 19-item questionnaire.

Good dental knowledge: Study participants who scored above the median value of overall knowledge score calculated from the 19-item questionnaire.

Unfavourable attitude: Study respondents who scored less than the median value of overall attitude score calculated from the 5-item questionnaire.

Favourable: Study participants who scored above the median value of overall attitude score calculated from the 5-item questionnaire.

Data Management and Analysis

The collected data were entered into Epi Data 3.1 software and checked for inconsistencies before analysis. Data exploration was used to identify and manage missing values, inconsistencies, and outliers. Then, data were coded to produce categorical variables from metric variables (eg, age, and income). Data analysis was performed by SPSS software version 20. Normality was checked by using Shapiro Wilk test ($X^2 = 0.96$, $df = 266$, p-value <0.05 for knowledge, and $X^2 = 0.88$, $df = 266$, p-value <0.05 for attitude) and visual inspection of histogram and box and whisker plots. Descriptive statistics including mean, median, frequency, and percentage on dental health problem determinants were calculated and presented in the form of tables. The dependent variable is coded as 0s and 1s (Cases = 1 and Controls = 0). Logit regression or logit model is used to estimate the probability of an event occurring having been given our dataset collected for this study. Logistic regression works with binary data, where either the event happens (cases = 1) or the event does not happen (controls = 0). In this model, the measure of association between dependent and explanatory variables is estimated by crude odds ratio (COR) and adjusted OR. The cut-off p-value for COR is 0.25, whereas for AOR the cut-off value is (p-value <0.05). Bivariable logistic regression and multivariable logistic regression analysis were done, and variables that were significantly associated in bivariable logistic regression at p ≤ 0.25 were further taken to multivariable logistic regression and then the significant association of each variable was declared at p-value <0.05.

A forward stepwise-likelihood ratio method of logistic regression used was significant at Omnibus Test of Model Coefficients ($X^2 = 75.42$, $df = 1$, and P-value <0.001), Model summary (−2 Log-likelihood = 291.91, Nagelkerke R square = 0.33), and Hosmer and Lemeshow test ($X^2 = 1.34$, $df = 4$, p-value = 0.84). The sensitivity and specificity of cases and controls are provided by the classification table (sensitivity of cases = 70.7% and specificity of controls = 74.8%, and the overall percentage of 72.8%).

Results

Socio-Demographic Characteristics

This study revealed that a total of 267 participants (134 cases and 133 controls) have participated in the interview giving a response rate of 100%. Of the total study participants, 75 (55%) of cases and 62 (46.6%) of controls were males. The mean age (± SD) of cases was 36.2 (± 14.2) years and that of controls was 31.4 (± 10.3) years. The Chi-Square analysis revealed that variables' religion, occupation, educational status, and average monthly income of the participants had a linear association with dental health problems at p-value <0.05 (Table 1).

Knowledge, Attitude, and Practice on Dental Health Problems

This study showed that 37 (27.6%; 95% CI: 19.9%, 35.3%) of cases and 60 (45%; 95% CI: 36.6%, 53.7%) of controls had good knowledge on the signs, symptoms, prevention, and control of dental health problems ($X^2 = 8.84$, $df = 1$, p-value <0.05). Similarly, 22 (16.5%; 95% CI: 10.1%, 22.9%) of cases and 51 (38.4%; 95% CI: 29.9%, 46.7%) of controls had favourable attitude towards the prevention, and control of dental health problems ($X^2 = 15.8$, $df = 1$, p-value <0.001). Moreover, 46 (34.3%; 95% CI: 26.2%, 42.5) of cases and 107 (80.4%; 95% CI: 73.6%, 87.3) of controls had good practice of brushing their tooth (Table 2). The Chi-Square analysis showed that there was tooth brushing difference among cases and controls ($X^2 = 58.1$, $df = 1$, p-value <0.001). The details are presented in the next table (Table 2). Out of the total participants 86 (64.2%) of cases and 69 (51.8%) of controls mentioned taking sugar foods as the cause of tooth decays. In addition to these, 81 (60.4%) of cases and 89 (66.9%) of controls thought that dental problem affects their general health (Tables 2–4).

Table 1 Socio-Demographic Characteristics of Study Participants, DBCSH Dental Clinic, 2018

Variables	Cases (n=134)		Controls (n=133)		X^2-value	df	P-value
	Frequency	%	Frequency	%			
Sex							
Male	75	55.9	62	46.6	2.34	1	0.126
Female	59	44.1	71	53.4			
Religion							
Orthodox	114	85.1	97	72.9	7.96	2	0.019
Muslim	17	12.7	24	18.0			
Protestant	3	02.2	12	09.1			
Occupation							
Student	23	17.2	26	19.5	30.31	5	<0.001
Gov't employee	20	14.9	47	35.3			
Merchant	23	17.2	29	21.8			
Farmer	43	32.1	14	10.5			
Daily labourer	15	11.1	14	10.5			
House wives	10	07.5	3	02.3			
Educational status							
No formal education	53	39.6	22	16.5	13.49	1	<0.001
Have formal education	81	60.4	111	83.5			
Average income							
<1500 ETB	75	55.9	57	42.8	4.6	1	0.032
≥1500 ETB	59	44.1	76	57.2			

Risk Factors Associated

After checking the assumptions of logistic regression, the following variables were statistically significant at a p-value less than 0.25; age group, sex, educational status, income category, access to dental health information, having radio, television, good knowledge, tooth brushing, drinking alcohol, and having gastritis. Then, controlling the confounding effects of independent variables, the following variables were statistically significant in a multivariable analysis at a 5% level of significance. These predictors were having access to health information on dental health (AOR = 0.28; 95% CI: 0.12, 0.64), tooth brushing practice (AOR = 0.24; 95% CI: 0.13, 0.45), and participants who had gastritis (AOR = 3.12; 95% CI: 1.14, 8.57) (Table 5).

Discussion

Out of eleven variables in bivariable logistic regression analysis, only three variables; dental health information, tooth brushing practice, and having disease gastritis were statistically significant contributing 33% of the variation in developing dental health problems (−2 Log-likelihood = 291.91, Nagelkerke R square = 0.33). This study explained that study participants who had adequate information on dental health had a reduced risk of developing dental health problems by 78% and participants who had a good practice of tooth brushing were at reduced risk of developing dental health by 76%. However, individuals who had gastritis were 3 times more likely to develop dental health problems compared with their counterparts.

A primary focus on prevention of dental health problems implementation of population-level interventions that improve the knowledge, attitude, and practice towards oral health through the concept of life course approach is mandatory. This study showed that dental health information reduced the burden of contracting dental health problems. This result is similar to the study finding in Addis Aba,[13] Debre Tabor,[6] Ethiopia, and on update[8] reviewed, in which dental health status was affected by the participant knowledge level. This may be due to that those individuals with better knowledge levels will have more desire to seek oral health care practice and hence prevent oral health problems. Moreover, the higher the health information about dental health problems, the chance of seeking health care especially dental check-ups will be increased. Additionally, they will also refrain from bad behaviours that can bring dental caries like drinking

Table 2 Response of Study Participants on Knowledge Assessing Questions in DBCSH Dental Clinic, Ethiopia, March 2018

Variables	Options	Cases		Control		X^2-value	df	P-value
		Frequency	Percent	Frequency	Percent			
Causes of tooth decay	Sugar foods	86	64.2	69	51.8			
	Germs	37	27.6	57	42.8			
	Hard foods	1	0.7	6	4.5			
	I do not know	10	7.4	1	0.7			
Tooth decay prevented	Yes	121	90.3	130	97.0			
	No	13	9.7	3	6.7			
Ways of prevention	Brushing after meal	96	71.6	80	60.2			
	Regular dental check-up	22	16.4	37	27.8			
	Avoid hard foods	18	13.4	16	12.3			
What causes black spot	Chat	102	76.1	117	87.9			
	Cigarette	113	84.3	111	83.5			
	Tea	11	8.2	10	7.5			
	Others	6	4.4	1	0.7			
Yellowish or brown colour on tooth	Unhealthy gum	114	85.1	124	93.2			
	Healthy gum	20	14.9	9	6.7			
What treatment would you prefer	Filling	23	17.2	40	30.0			
	Extraction	109	81.3	91	68.4			
	Artificial	0	0.00	1	0.7			
	I do not know	2	1.5	1	0.7			
Fluorides can prevent tooth decay	Agree	42	31.3	70	52.6			
	Disagree	91	67.9	63	47.3			
	Do not know	1	0.7	0	0			
Mouth wash prevent decay	Agree	82	61.2	114	85.7			
	Disagree	47	35.1	18	13.5			
	Do not know	5	3.7	1	0.7			
Healthy tooth looks	White and shiny	64	47.8	68	51.1			
	Strong and caries free	70	52.2	63	47.3			
	Do not know	0	0	2	1.5			
Sweet foods cause caries	Yes	123	91.8	126	94.7			
	No	11	8.2	7	5.3			
Cold drinks causes caries	Yes	32	23.9	55	41.4			
	No	102	76.1	78	58.6			
Is dental check-up important	Yes	93	69.4	108	81.2			
	No	41	30.6	25	18.8			
Knowledge status	Good	37	27.6	60	45	8.8	1	0.003
	Poor	97	72.4	73	55			

alcohol and chewing khat[6] and healthy behaviours like tooth brushing, flossing, and avoiding sweet food practice.[6,8,23,24]

Another important factor associated with dental health problems is tooth brushing. This study showed that tooth brushing practice reduced dental health problems by 76%

compared with individuals who did not brush their teeth. This finding is similar to the study finding of Bahir Dar Ethiopia, Uganda, and Palestine, and this may be due to the fact that tooth brushing practice may remove those food remnants and bacteria that can damage the tooth.[7,25,26] Similarly, a study from the University of

Table 3 Attitude of Study Participants Towards Dental Health Problems in DBCSH Dental Clinic, Ethiopia, March 2018

Variables	Options	Case (n)		Control (n)		X^2-value	df	P-value
		Frequency	Percent	Frequency	Percent			
Does oral health important for overall health?	Yes	121	90.3	129	96.9	4.25	1	0.039
	No	13	97.0	4	3.0			
Do you worry about your dental health?	Yes	123	91.8	128	96.2			
	No	11	8.2	5	3.7			
Why do we care about our teeth and gum health?	Have good smile	24	17.9	53	39.8			
	Prevent bad breath	109	81.3	118	88.7			
	To keep teeth healthy	94	70.1	96	72.1			
	To reduce treatment	30	22.4	54	40.6			
How much do you think dental problem can affect general health?	Always	52	38.8	43	32.2			
	Sometimes	81	60.4	89	6.1			
	Never	1	0.7	1	0.7			
How do you describe your dental health?	Excellent	3	2.2	6	4.5			
	Very good	4	2.9	54	40.6			
	Good	46	34.2	72	54.1			
	Poor	81	60.4	1	0.7			
How often did you have teeth or gum problem in the last one year?	Frequently	31	23.1	0	0			
	Sometimes	99	73.9	4	3.0			
	Never	5	3.7	128	96.2			
Attitude status	Favourable attitude	22	16.5	51	38.4	15.87	1	<0.001
	Unfavourable attitude	112	83.5	82	61.6			

Gondar, Debre Tabor, and Addis Ababa indicated the statistical association between tooth cleaning and poor dental hygiene with dental caries.[5,6,10]

Moreover, individuals with gastritis had more chance of developing dental health problems. As presented in the multivariable analysis, the risk of developing dental health problems increased by threefold when individuals had gastritis. This finding is similar to a cross-sectional study conducted in Southeast Iran, they concluded that there might be a relationship between poor oral hygiene and gastric precancerous lesions. Furthermore, they concluded that gastritis infection with Helicobacter Pylori (HP) bacteria in gastric histopathology might be associated with periodontal disease.[9] This can be explained in the way that an individual's oral health can have a direct impact on the gut health and vice versa. In other words, the presence of disease-causing microorganisms in the mouth can cause gums to become inflamed which can ultimately lead to gum disease. More worryingly, bad bacteria present in the saliva travels to the digestive tract when individuals swallow, causing digestive system problems including gastritis. Thus, the earlier people learn proper oral hygiene practices – such as brushing, flossing, and limiting once sugar intake – the easier it will be to avoid costly dental procedures and long-term health issues.[9,27–29]

Strengths and Limitations of the Study

As the study design is a case–control, cases and controls of study participants' confirmation were done by a dentist, which provides strong evidence for the measure of association. However, this study did not identify the causative agents and the pathogens involved in gastritis infection – what type of microbes were involved in gastritis infection was not investigated. Since this study was a part of the student research project, due to time and resource limitations, we did not perform kappa statistics, which quantity two measurement agreement. Other limitations can be some behavioural practices including tooth brushing

Table 4 Tooth Brushing Practice of Study Participants DBCSH Dental Clinic, Ethiopia, March 2018

Variables	Options	Cases (n=134)		Controls (n=133)		X^2-value	df	P-value
		Frequency	Percent	Frequency	Percent			
Tooth brushing practice	Yes	46	34.3	107	80.5	58	1	<0.001
	No	88	65.7	26	19.5			
Frequency of brushing	Daily	28	60.9	74	69.2			
	Weekly	15	32.6	33	30.8			
	Monthly	02	4.3	0	0			
Brush tooth per day	One times	24	85.7	57	77.1			
	Two times	4	14.3	17	22.9			
When do you brush your teeth?	After meal	29	21.6	67	50.3			
	Before meal	6	4.4	6	4.5			
	In b/n meals	3	2.2	20	15.0			
	Before & after meals	8	5.9	13	9.7			
Reason for brushing tooth	To avoid bad breath	29	53.0	82	76.6			
	To avoid tooth decay	40	87.0	81	75.7			
	To have whiter tooth	8	17.4	71	66.4			
Do you use tooth paste?	Yes	36	78.3	94	87.9	2.32	1	0.13
	No	10	21.7	13	12.1			
The role of tooth paste	Kills germs	28	60.9	94	87.9			
	Remove dirt	38	82.6	89	83.2			
	Tastes good	8	17.4	18	16.8			
Frequency of changing tooth brush	Once per year	1	0.7	3	2.2			
	After every 3 month	19	14.2	41	30.8			
	After 6 month	7	5.2	31	23.3			
	Lost or spoil	19	14.2	32	24.1			
What do you use for flossing?	Match stick	5	3.7	31	23.3			
	Inter dental brush	38	28.4	67	50.4			
	Thread	2	1.5	2	1.5			
Reasons for not brushing tooth	It hurts	6	4.4	1	0.7			
	Causes bleeding	44	32.8	17	12.7			
	No time	13	9.7	5	3.7			
	No brush	19	14.2	2	1.5			
	Not necessary	7	5.2	1	0.7			
Gum bleeding is prevented by	Bruising the tooth	18	13.4	42	31.5			
	Using vitamins	68	50.7	106	79.7			
	I do not know	60	44.7	21	15.8			
Have you ever visited dentist?	Yes	95	70.9	2	1.5	138	1	<0.001
	No	39	29.1	131	97.7			

practices used in the analysis were self-reported by the respondents; self-reported data may introduce inaccuracy and bias into the estimates of behaviour. However, to reduce social desirability, and information bias, participants were informed to respond genuinely and honestly during oral informed consent. Moreover, due to its institution-based study, it is difficult to generalize the results to the community. Therefore, the use of this study's findings should be considered as having these inherent limitations.

Table 5 Bivariable and Multivariable Logistic Regression Analysis of Dental Health Problems Among Adult Patients at Debre Berhan Comprehensive Specialized Hospital Dental Clinic, Ethiopia, March 2018

Variables	Cross Tabulation		COR (95% CI)	P-value	AOR (95% CI)
	Cases	Controls			
Age group (in years)					
<25	33	42	0.35 (0.17, 0.70)	0.003	-
25–30	28	36	0.35 (0.17, 0.71)	0.004	-
30–41	28	35	0.36 (0.17, 0.73)	0.005	-
>41	45	20	1		
Sex					
Male	75	62	1	0.127	-
Female	59	71	0.68 (0.43, 1.11)		
Educational status					
No formal Edu	53	22	3.30 (1.86, 5.86)	<0.001	-
Has formal Edu	81	111	1		
Income categories					
<1000 ETB	58	39	1.82 (1.09, 3.02)	0.021	-
≥1001 ETB	76	93	1		
Have information about dental health?					
Yes	78	123	0.11 (0.06, 0.24)	<0.001	0.28 (0.12, 0.64)
No	56	10	1		
Have radio?					
Yes	102	122	0.26 (0.12, 0.56)	0.001	-
No	32	10	1		
Have television?					
Yes	51	83	0.37 (0.23, 0.61)	<0.001	-
No	83	50	1		
Knowledge status					
Poor	97	73	2.16 (1.29, 3.59)	0.003	-
Good	37	60	1		
Do you brush your teeth?					
Yes	46	107	0.13 (0.07, 0.22)	<0.001	0.24 (0.13, 0.45)
No	88	26	1		
Ever drunk alcohol?					
Yes	99	82	1.76 (1.05, 2.96)	0.033	-
No	35	51	1		
Have diagnosed gastritis?					
Yes	28	06	5.59 (2.23, 14.01)	<0.001	3.12 (1.14, 8.57)
No	106	127	1		

Abbreviations: COR, crude odds ratio; CI, confidence interval; AOR, adjusted odds ratio.

Conclusion

In conclusion, the determinants of dental health problems in this study were having perceived dental health information, tooth brushing practice, and being affected by gastritis infection. Proper health information dissemination to the community about oral health-related care and dental health care practice including regular dental check-ups twice a year, proper tooth brushing practice believed to improve dental health status. However, digestive system problems like gastritis infection can increase the risk of developing dental health problems. This implies that improving community dental health care and practice through promoting proper tooth

brushing, flossing, and preventing gastritis can enhance oral health-related quality of life among patients and the community. Moreover, since dental health is a lifelong commitment practice, comprehensive approaches should be designed based on the life-course framework to strengthen the available behavioural change communication.

Abbreviations

CVD, cardiovascular disease; DBCSH, Debre Berhan Comprehensive Specialized Hospital; DBU, Debre Berhan University; DM, diabetes mellitus; GBD, Global Burden of Disease; NCDs, non-communicable diseases; ROSC, recommended oral self-care; WHO, World Health Organization.

Data Sharing Statement

The data used to support the findings of this study are included in this manuscript (Tables 1–5).

Ethical Consideration

Ethical clearance was obtained from Debre Berhan University (DBU), College of Health Sciences (HSC), and the Ethical Review Committee (ERC) (Protocol number 10/18/SPH). Permission letter also obtained from Debre Berhan Comprehensive Specialized Hospital dental clinic to inform and support the data collection process. Oral informed consent which was approved by ERC was gained from the study participants by explaining the likely benefits of the study (Supplementary Materials). Moreover, participants were told that they can stop the interview at any point during data collection if they are uncomfortable and if they do not want to answer a particular question. Moreover, this study followed the principles of the Declaration of Helsinki and was approved by the Ethical Review Committee of DBUHSC.

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Author Contributions

All authors contributed to data analysis, drafting or revising the article, gave final approval of the version to be published, agreed to the submitted journal, and agree to be accountable for all aspects of the work.

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Disclosure

The authors declare that they have no conflicts of interest for this work.

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