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Assessment of Oral Hygiene Practice and Associated Factors among Middle-aged People in a Rural Municipality, Nepal

Maheshor Kaphle[1,*], Achel Tamang[2], Rajesh Karki[3], Nirmala Regmi[4], Renu Khadka[1], Mangesh Bajracharya[5]

[1]Department of Public Health, Peoples Dental College and Hospital, Kathmandu, Nepal

[2]Department of Public Health, CiST College, Kathmandu, Nepal

[3]Department of Public Health, Yeti Health science Academy, Kathmandu, Nepal

[4]Department of Oncology, Kanti Children's Hospital, Kathmandu, Nepal

[5]Department of Dentistry, Peoples Dental College and Hospital, Kathmandu, Nepal

*Correspondence should be addressed to Maheshor Kaphle, kafmahesh@gmail.com

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Abstract

Background/Aims: Good oral hygiene practice helps to prevent oral cavity diseases and dental problems. This study aims to assess oral hygiene practices and their associated factors among middle-aged people in a rural municipality of central Nepal. **Materials and Methods:** This study collected data from 291 middle-aged adults in rural Nepal using a semi-structured questionnaire. The data was entered into Epi-data 3.1 and analyzed using SPSS 22. An oral hygiene score was calculated based on good oral hygiene practices, and chi-square tests and logistic regression models were used to measure associations between variables. Adjusted odds ratios were calculated to measure net effects, with a *p*-value of 0.05 considered as significant association. **Results:** The study found that the majority of respondents (80%) brushed their teeth once a day, with over half (56.7%) having poor oral hygiene practices. The majority (60%) changed their toothbrush every three months, and most (98%) used toothpaste but did not know about the benefits of fluoride. A significant association was found between age (p=<0.001), gender (p=0.011), education (p=<0.001), income (p=0.018) and employment status (p=0.037) visits with oral hygiene practices. Females had three times higher odds of good oral hygiene practices than males (OR: 3.51(1.86-6.62)), literate individuals had higher odds of good oral hygiene (OR: 2.04(1.06-3.92). **Conclusions:** The study found that most respondents brushed their teeth once a day, with over half having poor oral hygiene practices. Gender and education were associated with good oral hygiene practices. The study suggests the need for oral health services and hygiene awareness programs in rural areas.

Keywords: Adults, Dental caries, Nepal, Oral hygiene, Rural population

Introduction

The experience of pain, and problems with eating, chewing, smiling, and communication due to lost discolored, or damaged teeth have a major impact on people's daily lives and well-being [1]. Oral diseases are still public health problems with high prevalence and incidence all around the world [2]. Poor oral hygiene practice leads to periodontal disease and dental caries which is one of the most frequent dental problems [3]. Oral health problems are mostly preventable through good oral hygiene habits and regular preventive dental visits [4]. Cleanliness of teeth, gingiva, tongue, and all parts of the oral cavity is considered to be a comprehensive part of oral hygiene [5]. Proper oral hygiene is important for preventing oral and dental disease including gingivitis periodontal diseases and dental caries [6,7]. Good oral hygiene practices promote a good personality, prevent oral cavity diseases, and promote quality of life [8]. Additionally, good oral hygiene is the baseline foundation for controlling more than 80% of oral diseases [6]. Poor oral hygiene practices can lead to oral health

problems including offensive breath, as well as several other co-morbidities such as cardiovascular diseases, respiratory diseases, kidney diseases, and oral cancers [9-11]. Oro-pharyngeal cancers are the most serious oral health problems which cause more death than cervical cancer [12].

The most important oral health global burden of disease in oral health is due to periodontal diseases and dental caries among industrialized developed countries and developing nations [1]. Oral diseases affect nearly 3.5 billion people worldwide. Untreated dental caries in permanent teeth is the most common health condition according to the Global Burden of Disease 2019 [13]. Globally, the greatest burden of oral diseases lies on disadvantaged and poor populations [14]. Poor oral hygiene can have an adverse effect on the overall health and quality of life of a person [15]. Nearly every adult has at least one dental caries, almost 30% of people in the world aged between 65 to 80 do not have any natural teeth left and more than 50% of the school children have at least one dental caries [16]. Most people practice cleaning their teeth at least once a day in Nepal and a substantial number of the population use fluoridated toothpaste [17]. According to Nepal national pathfinder survey, the prevalence of dental caries among adults aged 35-49 years was 57.5% and those aged >50 years were 69.6% [18]. People in rural areas have comparatively poor oral hygiene practices [19] and have high oral care needs [20]. According to the study in Nepal, more than fifty percent of the participant have below-average practice in oral hygiene (55.8%) and only 44.2% of the participant have above-average practice in oral hygiene [21]. Another study conducted in the Kaski district of Nepal showed that education is an important factor associated with oral health status [22]. Individuals with higher education had significantly higher odds of getting good oral hygiene practices compared to those with lower education levels [23].

This study was conducted in a rural municipality, where the majority of the population had little to no knowledge about good oral hygiene practices, and very few practiced dental flossing on a daily basis. People tended to visit a dentist only when they experienced severe pain or toothache. Moreover, the majority of the people in this study area belonged to marginalized castes in Nepal. The previous study revealed that poor and marginalized people were more likely to experience oral health problems in Nepal [18]. Alcohol intoxication and smoking dependence are their cultural and ritual system [24]. Additionally, most studies have focused on school children [6,25-29], with very few community-based studies conducted in rural areas and among marginalized ethnic groups. Therefore, the aim of this study is to assess oral hygiene practices and their associated factors among middle-aged people in a rural municipality in the Dhading district of Nepal.

Materials and Methods

Study area and period

The study was conducted in a community setting in the central part of the country, Netrawati Dabjong rural municipality, Bagmati province, Dhading district from May to October 2022. This rural municipality was 85 km northwest of the capital city. The majority of the community are *Tamang* tribal ethnic group, thus this rural municipality was chosen for study. The Tamang community is marginalized, has low socioeconomic and poor health status, and low literacy rate [30,31]. These Groups are coded as the *Janjati* group in this study. Two wards among five were selected randomly by lottery method.

Study design, participants, and variables

Community-based quantitative cross-sectional study design was conducted among middle-aged adults (40-60 years). One individual from each household was included. We took sociodemographic characteristics such as age, gender, occupation, income, employment status, education, ethnicity, and dental condition such as dental caries, toothache, gingivitis, and previous dental visits as independent variables and oral hygiene practice as dependent variables. Behavioral patterns such as frequency of brushing, use of toothpaste, fluoride in toothpaste, the technique of brushing, time of changing brush, and oral rinse and eating practices were also used as dependent variables. These variables were chosen based on literature review [32,33].

Sample size and sampling procedure

Sample size was calculated by using a single population proportion formula. A previous study found that 41.9% of people used toothbrushes and fluoridated toothpaste and not using any tobacco products [34]. By considering this as good oral hygiene practice, the sample size was 375. The household population of selected wards was found to be 1195. By applying the formula [35] for finite population $\left(n = \frac{n^{\circ}}{1+n^{\circ}-1/N}\right)$ the sample size was calculated. Where n= sample size, n°=375, and N=1195. By calculation, the final sample size was 285.62. We took 291 respondents by adding some surplus data. All people aged between 40 to 60 years were included because this group need high oral care [20,36].

Two wards were randomly selected from a total of five wards. All the eligible participants from the selected household were identified from the selected wards and a sampling frame was constructed. If there were more than one eligible member, only one most senior (age-wise) individual was taken as a sample from each selected household. We used a systematic random sampling technique for the selection of households. The center place was identified from each selected ward to start the data collection. The sampling interval was calculated

by total household number i.e., 1195 divided by sample size 291 and obtained 4.10, so data was collected for every 4th household until the sample size was reached. First household and direction were identified by bottle spin method [37,38]. Patients taking medication for severe mental illness and who refused to participate in the study were excluded [39] and those participants who refuse to participate in this study were excluded.

Data collection tools and procedure

Since the standard tools to measure oral hygiene status could not be found in literatures, we formulate semi-structured questionnaire after intensive literatures review [40-42] and finalized by the study team in consultation with another public health expert. The data collection tool consisted of the three parts: socio-demographic characteristic, behavioral practice, and eating practice. The dependent variable (oral hygienic practice) was assessed by behavioral and eating practices. Data collectors were properly trained, and questions were clearly explained during data collection to maintain data integrity, improve data quality, enhance reliability and validity, promote participant understanding, and ensure adherence to ethical standards. The face-to-face interview was conducted with one respondent from each household. Senior (age-wise) member of the household was interviewed if there were more than one member aged 40-60 years within the family. One health professional was recruited for data collection and a BDS doctor was supervising.

Measurement of oral hygiene practice

Poor oral hygienic practice: There were 18 items to assess hygiene practices. Questions from behavioral and eating practice were summed up by providing a 'one' score for hygienic and a 'zero' for unhygienic practices for calculation of poor and good hygienic practices. The total score was obtained from 18 practice questions. Cut-off scores below average/mean (mean=9.91) were categorized as poor oral hygiene practice [42].

Good oral hygienic practice: Cut-off scores equal to and more than the mean were categorized as good oral hygiene practice [42].

Data quality control

The questionnaire was prepared after intensive discussions among the study team and was finalized after pretesting 10% of the population. Initially, the questionnaire was prepared in English and then back-translated to Nepali by collaborating closely with a local language expert, an English language expert, and a dental healthcare professional. This collaboration ensured technical consistency and reliability. One researcher was responsible for data collection to maintain the validity of the questionnaire. The collected data was promptly checked and rechecked by a dental doctor to ensure data quality.

Data processing and analysis

Epi-Data version 3.1 was used to enter the data after the necessary validation and generation of check files. Data was then transferred, cleaned, and analyzed in SPSS 22. Descriptive statistics such as frequency, percentage, a measure of central tendency, etc. were calculated according to the characteristics of variables. The information was presented in a summary and descriptive table for further interpretation. We used bivariate analysis to measure the association between independent and dependent variables by chi-square test. We calculated the odds ratio and 95% confidence interval to find out the significant association between the study and outcome variables. The variables which were significantly associated with dependent variables with $p<0.05$ in bivariate analysis were further analyzed using the logistic regression model in multivariate analysis. Adjusted odds ratio (AOR) was calculated to measure the net effect with independent variables. In multivariate analysis, the variance inflation factor (VIF) was performed to check the multicollinearity among independent variables. The Hosmer-Lemeshow test (0.859 for this study) was performed to test the goodness of fit for the regression model.

Ethical consideration

A verbal explanation of objectives was given to the rural municipality office for permission for data collection. The purpose and objectives of the study were explained to all the respondents. Written consent was taken from each respondent. Confidentiality of information from respondents was highly maintained. Ethical approval was taken from IRC-CiST (Ref. no: 135/078/079).

Results

Sociodemographic characteristics

Altogether 291 respondents were included in this study. Among all respondents, 52% were male and 40.9% were illiterate with a mean age of 50.55 (± 4.89). More than 76% were *Janjati* caste followed by the upper caste group (**Table 1**).

Respondents practice oral hygiene

The majority of respondents, i.e., 80%, practiced brushing their teeth once a day. Among them, 60% of respondents changed their toothbrush every three months. Surprisingly, 1.4% of participants responded that they never brush their teeth. The majority of respondents, i.e., 98% didn't know about fluoride and its benefits. The majority i.e., 79.8% of respondents reported that they have fluoride in their toothpaste. The majority of (62.2%) respondents have visited

Table 1. Sociodemographic characteristics of respondents among middle aged people in rural Nepal 2022(n=291).		
Variables	**Characteristics**	**Number (%)**
Age (mean ± SD)	50.55 (± 4.89) years	
Age group	40-50	146 (50.2)
	51-60	145 (49.8)
Gender	Male	153 (52.6)
	Female	138 (47.4)
Education status	Illiterate	119 (40.9)
	Non formal	20 (6.9)
	Primary level	109 (37.5)
	Secondary level	42 (14.4)
	Bachelor	1 (0.3)
Monthly income (*In Nepali currency*)	Up to10,000	244 (83.8)
	>10,000	47 (16.2)
Employment status	Employed	42 (14.4)
	Unemployed	249 (85.6)
Religion	Hindu	83 (28.5)
	Buddhist	206 (70.8)
	Christian	1 (0.3)
	Others	1 (0.3)
Ethnicity	*Dalit*	25 (8.6)
	Janjati	222 (76.3)
	Upper caste group	44 (15.1)
Family type	Nuclear	140 (48.1)
	Joint	151 (51.9)

Table 2. Respondents practice on oral hygiene.		
Oral hygiene practice	**Characteristics**	**Number (%)**
Frequency of tooth brushing	Never	4 (1.4)
	Once a month	19 (6.5)
	Once a week	29 (10.0)
	Once a day	234 (80.4)
	Twice a day or more	5 (1.7)
Time taken for toothbrush	<than 2 min	247 (84.9)
	At least 2 min	44 (15.1)
Time of changing toothbrush (n=287)	Every one month	24 (8.4)
	Every three month	174 (60.6)
	Every six months	63 (22.0)
	Every year	26 (9.1)

Use of toothpaste(n=287)	Yes	287 (98.6)
	No	4 (1.4)
Fluoride in toothpaste(n=287)	Yes	229 (79.8)
	No	58 (20.2)
Technique of toothbrushing(n=287)	Circular	2 (0.7)
	Horizontal	3 (1.0)
	Vertical	2 (0.7)
	Horizontal and vertical	280 (97.6)
Dental floss	Yes	1 (0.3)
	No	290 (99.7)
Oral rinse (n=291)	Yes	287 (98.6)
	No	4 (1.4)
Use of tooth pick	Yes	278 (95.5)
	No	13 (4.5)
Times of visiting dentist	Never	109 (37.5)
	During/after toothache	181 (62.2)
	Once a year	1 (0.3)

a dentist only when they have a toothache and surprisingly, 37.5% of respondents never visited a dentist (**Table 2**). Moreover, a person's dietary habits can have an impact on oral hygiene as well. The research findings showed that more than two-thirds of the respondents used tobacco products, while nearly one-third (32%) of the participants were alcohol intoxicants. Over half (54%) reported consuming biscuits and nearly one-thirds (32%) consumed sweet candy in their daily food intake (**Table 3**).

Table 3. Respondents behavioral practice on food habit related oral hygiene.

Behavioral practice	**number (%)**
Smoking habit	196 (67.4)
Tobacco chewing	230 (79.0)
Use of alcohol	95 (32.6)
Use of Biscuit	157 (54.0)
Use of sweet candy	93 (32.0)
Use of Jam/Honey	56 (19.2)
Use of coke and soda	123 (42.3)
Sweet Tea and coffee	280 (96.2)

The overall level of oral hygiene practices

Among all 291 respondents, 56.7% have poor, while 43.3% have good oral hygiene practices (**Figure 1**).

Affecting factors with oral hygienic practice among middle-aged people

Association between socio-demographic variables such as age, sex, education, monthly income, and employment status were identified to be significantly associated to oral hygienic practice (**Table 4**).

Associated factors with oral hygienic practice among middle-aged people

In the multivariate analysis, a variance inflation test (VIF) was performed among the independent variables, and the highest reported VIF was 2.87, suggesting no issues of multicollinearity. Regarding socio-demographic variables, the results indicate no significant difference between oral hygiene practices and age group, income, and employment groups. Similarly, the results reveal that females have three times higher odds of having good oral hygiene practices compared to males (AOR: 3.51, 95% CI: 1.86-6.62), and literate individuals have higher odds of having good oral hygiene practices compared to illiterate individuals (AOR=2.04, p=0.032) (**Table 5**).

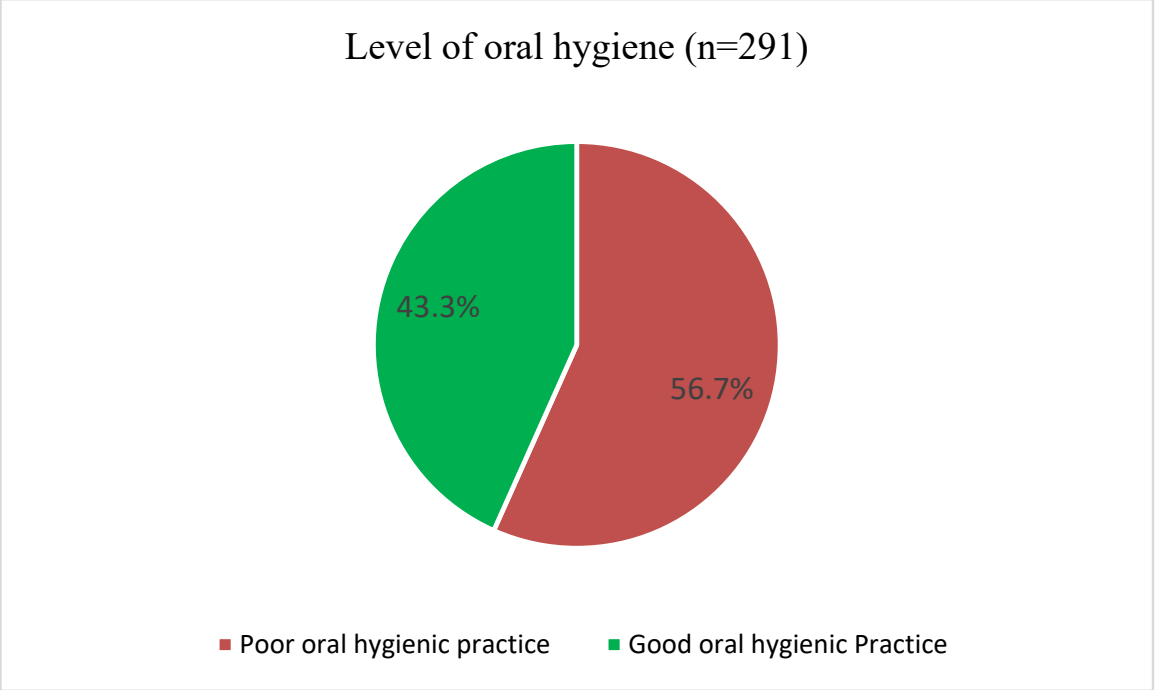

Figure 1. Level of oral hygiene of respondents among middle-aged people in rural Nepal.

Table 4. Association between socio-demographic variables and oral hygiene.

Variables	Attributes	Practice		
		Poor n (%)	Good n (%)	p-value
Age	40-50	100 (68.5)	46 (31.5)	<0.001**
	50-60	65 (44.8)	80 (55.2)	
Gender	Male	76 (49.7)	77 (50.3)	0.011*
	Female	89 (64.5)	49 (35.5)	
Education	Literate	109 (63.4)	63 (36.6)	<0.006**
	Illiterate	56 (47.1)	63 (52.9)	
Monthly income	Up to 10,000	131 (53.7)	113 (46.3)	0.018*
	More than 10000	34 (72.3)	13 (27.7)	
Ethnicity	Under Privilege	128 (57.7)	94 (42.3)	.555
	Privileged	37 (53.6)	32 (46.4)	
Employment status	Employed	30 (71.4)	12 (28.6)	0.037*
	Unemployed	135 (54.2)	114 (45.8)	

**Significant at p-value <0.05 level, **Significant at p-value 0.01 from chi-square test*

Table 5. Logistic regression analysis of factors associated with oral hygiene practice.

Variables		Practice		COR		AOR	
		Poor n (%)	Good n (%)	p-value	(95%CI)	p-value	(95%CI)
Age(year)	40-50	100(68.5)	46(31.5)	<0.01**	1 (Ref.)	0.183	1
	50-60	65(44.8)	80(55.2)		2.67(1.65-4.31)		1.47(.83-2.63)
Gender	Male	76(49.7)	77(50.3)	0.011	1.84(1.14-2.94)	<0.01**	3.51(1.86-6.62)
	Female	89(64.5)	49(35.5)		1(Ref.)		
Education	Illiterate	56(47.1)	63(52.9)	0.01**	1(Ref.)	.032*	1
	Literate	109(63.4)	63(36.6)		1.94(1.21-3.13)		2.04(1.06-3.92)
Monthly income	Up to 10,000	131(53.7)	113(46.3)	0.020*	1(Ref.)	.284	1
	>10000	34 (72.3)	13 (27.7)		2.25(1.13-4.48)		.67(.25-1.78)
Employment status	Employed	30(71.4)	12 (28.6)	0.04*	0.47(.23-.96)	.37	.63(.23-1.72)
	Unemployed	135 (54.2)	114 (45.8)		1(Ref.)		1

**Significant at p-value <0.05 level, **Significant at p-value 0.01*

Discussion

The use of brushing tools such as toothbrush and toothpaste are important indicators of oral hygiene. In the current study, the majority of respondents i.e., 80% practiced brushing their teeth once a day. According to a study conducted in India, among the middle aged rural women, the majority of respondents brushed their teeth once a day [20]. It shows that people have normalized brushing their teeth once a day in both study areas although the study areas are different.

The ideal time for changing the brush is 3-4 months. A good brush can effectively clean teeth and help to maintain oral hygiene and fluoridated toothpaste protects from dental caries. In the current study, the majority of respondents (60%) changed their toothbrush every three months and the majority of respondents i.e., 98% did not know about fluoride and its benefits. Similarly, a study in urban city of Nepal found similar finding for changing brush but contradict with the result of fluoridated toothpaste [43]. In contrast, a study among students in Odisha (India), found that nearly 34.53% of the students changed their toothbrushes once in 2 months and nearly 45.6% of the students always used fluoridated toothpaste [44]. This contrast is due to different study subjects and areas. Our study was focused in rural areas and nearly half of them were illiterate. The combination of horizontal and vertical tooth brushing techniques is a good technique and easy to teach community people and can help to remove plaque and food particles from the gumline. Our finding revealed that the majority of the population brushed their teeth in the horizontal and vertical directions was supported by the literature found [45].

As per the current study findings, about 62.2% of respondents have visited a dentist only when they have dental pain and 37.5% never visited a dentist which is similar to the findings of the study conducted in Saudi Arabia [25] and Dharan, Nepal [46]. This shows that people visit the dentist mostly when they have oral health problems which could be due to the very expensive cost of treatment in Nepal [47]. The current study revealed that more than half (56.7%) were practicing poor oral hygienic practice. A study conducted in Ethiopia found that more than 27% had poor knowledge [42]. This huge difference is due to different study areas. But another study from Saudi Arabia found nearly the same result [48]. Nearly two-thirds of the respondents i.e., 65.6% had oral health-related problems. Among them 61.5% had dental caries. According to the study conducted among German refugees, 79% of the participants had dental caries [49]. So, these findings showed that the oral hygiene was not satisfactory.

As per our results, oral hygiene practice was found to be statistically significant to the age of the respondents, which is in agreement with the literature found [50-52]. Association between socio-demographic variables such as sex and education were identified to be significantly associated with oral hygienic practice in this study. The study conducted among USA ethnic group [53], STEPS survey Nepal [17], and a study in Burkino Faso [54] supports our result that more knowledgeable and educated people are performing better hygiene practices than uneducated people. Socio-economic status and oral hygiene index are statistically significant [55]. According to the study conducted in UAE, being employed is significant with oral hygiene practice [56] which was consistent with our study.

Previous studies found that dental caries and periodontal diseases are significantly associated with oral hygiene-related behavior [57]. Dental problems and dental visits were significantly associated [58]. People who were facing problems related to oral health were practicing better oral hygiene behavior.

This study found that the odds of using good oral hygiene practices are increasing with age (AOR: 2.67, 95% CI: 1.65-4.31) in bivariate analysis which is supported by the study done in American middle-aged (35-44 years). Navajo Native Americans were showing better oral hygiene scale scores compared with the older age group in multivariate analysis [59]. Oral hygiene practice gets better as age increases (AOR=0.722 (0.277-1.880) [42].

In this study, people with good income are more likely to adopt better oral hygiene practices (AOR: 2.25(1.13-4.48)) which is supported by the study in India which revealed, more affluent people have better oral health status [55]. Current study found that literate people were two times more likely to have good oral hygiene practice than illiterate (AOR: 2.04(1.06-3.92)). High level of education increase the opportunity to involve in oral health promoting behavior [60] and study conducted in Iran also support our finding [61].

Limitations and Strength

The limitation of this study is the possibility of information bias because we have only collected self-recorded dental conditions. Selection bias may also exist because of the age limit in 45-60 years. Recall bias may also exist when exploring behavioral and food consuming practice. We did not perform clinical examinations to confirm the reported dental conditions. Generally, there are nine wards in a rural municipality of Nepal. So due to the limited sample size and area, the findings of this study may not be generalizable to the large population of urban areas. However, this study was conducted in a rural area of Nepal and among the adult population, which is the strength of this study. This study finding helps rural municipalities to emphasize following good oral hygiene practices to reduce dental diseases.

Conclusion

In this study, middle-aged adults, most of the respondents brushed their teeth once a day, and all the people who brushed their teeth used toothpaste. The majority of respondents had no knowledge about fluoride and its benefits. More than half of the respondents had poor oral hygiene practices. Among oral health-related problems, dental caries was the most prevalent problem. Gender and education were factors associated with oral hygiene practice. Oral health services, awareness programs, and campaigns need a special focus on low-education clusters to be organized by the rural municipality to improve oral hygiene practice. Rural municipality is also suggested to add oral health services in existing health service outlet, so that people may also get oral hygiene awareness that promote oral health services.

Conflict of Interest

The authors declared that they have no competing interest.

Data Availability

The data used to generate the findings of this study will be available from the corresponding author with the reasoned requests.

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Authors Contribution

MK helped to prepare proposal, data analysis, wrote and reviewed the manuscript, AT prepared proposal, collected data and wrote the report, RK prepare and reviewed the manuscript, NR revised and reviewed the manuscript, R Khadka revised and reviewed manuscript, and MB supervised data collection, data cleaning, and reviewed the manuscript. All authors read and approved for the final paper.

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