

Research Article

## Dental Self-Care Habits and Self-Reported Caries Amongst the Elderly in South-Western Kenya

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### Abstract

**Background:** Dental diseases continue to plague elderly populations worldwide with multiple effects on health, nutrition and wellbeing. Nevertheless, little is known concerning geriatric oral hygiene behavior and its association with dental caries in rural Kenya. This knowledge could be instrumental in shaping geriatric oral health interventions.

**Aims:** To explore relationship between dental self-care habits and self-reported caries amongst the elderly in south-western Kenya.

**Methods:** A cross-sectional analytical study was done among a random sample of 300 elderly persons in southwestern Kenya. Data pertaining to caries prevalence, sociodemographic characteristics as well as dental self-care habits was gathered through structured questionnaires and analyzed on SPSS v.25. Association between variables was explored using Pearson's chi-square test and multiple logistic regression.

**Results:** Prevalence of self-reported caries was 52.3%. The distribution of caries differed significantly across

categories of respondents' location ( $X^2 = 48.90, P < .001$ ), educational levels ( $X^2 = 8.95, P = .030$ ), employment status ( $X^2 = 5.49, P = .019$ ) and self-rated economic status ( $X^2 = 4.52, P = .034$ ). Brushing frequency (OR=5.15), use of toothpaste (OR=4.80), dental visit (OR=5.91), and believing tooth decay is inevitable (OR=2.42) were the leading covariates of self-reported caries.

**Conclusion:** Caries prevalence was high among geriatric population in southwestern Kenya. Brushing frequency, aids, dentifrice, literacy and attitudes were associated with dental caries. Geriatric dental self-care habits were largely shaped by their caries experience. Targeted interventions to mitigate discrepancies in oral hygiene behavior is recommended.

**Keywords:** Elderly; Dental Caries; Kenya; Oral Hygiene; Prevalence; Self-report

## 1. Introduction

Dental diseases continue to plague elderly populations worldwide with multiple effects on health, nutrition and wellbeing [1]. Africa is particularly affected, with little priority given to geriatric dental health and its social determinants [2, 3]. Dental caries has been reported to constitute the greater burden of dental morbidities among the elderly across the world with prevalence in excess of 40% [4-6]. However, few studies exist for the African continent [7], despite its growing geriatric population [2]. Indeed it is reported that geriatric oral dental research is still under-prioritized in the African continent [2, 8]. Like other African nations, geriatric population in Kenya has increased exponentially in recent decades to constitute nearly 4% of the total population in latest estimates [9]. Nevertheless,

epidemiological studies on dental caries are largely for the younger age-groups [10-12]. An earlier research among the elderly in Kenya found that over 80% had carious teeth [13]. Dental caries can trigger toothache and affect mastication of food with the resulting nutritional implications [5], and, if left untreated, lead to eventual tooth loss further deteriorating health and wellbeing of the elderly [14, 15]. Dental self-care compass actions taken up by individuals to promote or protect oral health and include, among other things, brushing, use of dentifrices and dental visits [16]. These actions are mediated by related knowledge and attitudes [17, 18]. In extant literature, these habits are reported to relate significantly with dental caries. Regular brushing with dentifrices is protective of dental caries [19, 20] and so is regular dental visit [21, 22]. However, little is known about geriatric dental self-care and its association with caries in rural Kenya. This study sought to assess the prevalence of self-reported caries and its association with dental self-care habits among community-dwelling elderly in southwestern Kenya. Such information could be instrumental in shaping geriatric oral health interventions.

## 2. Materials and Methods

This was a cross-sectional analytical study done amongst 300 elderly  $\geq 65$  years in a rural community in southwestern Kenya. The study participants were selected by proportionate stratified sampling technique. The population was stratified by administrative locations and the number of participants determined in a manner proportionate to the size of the stratum. Data was gathered using an interviewer-administered questionnaire translated to the local language. The questionnaire consisted of three sections:

Sociodemographic characteristics (8 items), Dental morbidity (1 item) and oral hygiene behavior (9 items). Dental caries was assessed through self-reported presence/absence of cavities by posing the question “does any of your teeth have cavities?” Participants responding “yes” were classified as having caries. The survey instrument was piloted with 10% of the sample size in a neighboring community. SPSS version 25 was used for analysis. Sociodemographic characteristics were summarized using frequencies. Group differences were tested by Pearson’s chi-square. Associations between dental self-care habits and self-reported caries was explored using multiple logistic regression to determine odds and corresponding confidence intervals. Two logistic regression models were constructed. The crude model was constructed using the forced entry method with all explanatory variables entered in block 1. The adjusted model was constructed hierarchically with possible confounding variables iterated first followed by dental self-care covariates. Significance was set at .05. The study was approved by the University of Eastern Africa, Baraton’s ethics review committee and informed consent was signed by the respondents acknowledging their voluntary participation. Confidentiality of respondents’ data was maintained by only sharing aggregate results.

### 3. Results

#### 3.1 Sociodemographic characteristics

Majority of the respondents were females (55.3%), aged between 65 to 74 years (64.7%), came from *Kanjira* location (42.7%), had only primary education (56.7), and never had formal employment (82.3%). More than three quarters had no health insurance (78.0%) and

reported poor-very poor economic status (79.3%), while slightly one in ten (12.7%) were living alone (Table 1).

#### 3.2 Prevalence and distribution of self-reported caries

Over half (52.3%) the participants indicated they had caries. The distribution of caries (Table 2) differed significantly across categories of respondents’ location ( $X^2$  (3,  $N=300$ ) =48.90,  $P< .001$ ), level of education ( $X^2$  (3,  $N=300$ ) =8.95,  $P= .030$ ), employment status ( $X^2$  (1,  $N=300$ ) =5.49,  $P= .019$ ) and self-rated economic status ( $X^2$  (1,  $N=300$ ) =4.52,  $P= .034$ ).

#### 3.3 Association between dental self-care characteristics and self-reported caries

The results of goodness of fit test indicated the unadjusted ( $X^2$  (8,  $N=300$ ) =81.27,  $P<0.001$ ) as well as the final ( $X^2$  (8,  $N=300$ ) =75.14,  $P<0.001$ ) models were statistically significant. The crude model explained between 23%-31% of the variance in self-reported caries, while the adjusted model explained between 35%-47% of the variance in self-reported caries (Cox & Snell and Nagelkerke R Square, respectively). As shown in (Table 3), six (6) of the independent variables significantly predicted self-reported caries across the crude and adjusted models. Brushing daily (OR=3.83 and 5.15), use of toothpaste (OR=4.46 and 4.80), dental visit (OR=4.78 and 5.91), and believing tooth decay is inevitable (OR=1.95 and 2.42) were associated with higher risks of self-reported caries in both crude and adjusted models respectively. There was lower risk of self-reported caries among respondents who used commercial toothbrushes (OR= 0.18, 95% CI: 0.06-0.57), but the association did not hold true in the final model (OR= 0.29, 95% CI: 0.08-1.067). Likewise,

knowledge of the recommended usage period for toothbrushes had significant association with self-reported caries (OR=0.31, 95% CI: 0.16-0.59) but did not hold in the final model (OR = 0.52, 95% CI: 0.25-1.04). On the other hand, knowing teeth should be

brushed daily (OR = 0.35, 95% CI: 0.16-0.78) and acquiescing to visit a dentist only when having acute dental problem (OR= 2.32, 95% CI: 1.10-4.86) had significant association with self-reported caries in the adjusted model only.

Characteristic	Frequency (n)	Percent (%)
<b>Age</b>		
65-69	82	27.3
70-74	112	37.3
75-79	63	21.0
80-84	29	9.7
85+	14	4.7
<b>Gender</b>		
Female	166	55.3
Male	134	44.7
<b>Location</b>		
Kanjira	128	42.7
Kateng	43	14.3
Wagwe	61	20.3
Kataa	68	22.7
<b>Education</b>		
No Formal education	79	26.3
Primary	170	56.7
Secondary	38	12.7
Tertiary	13	4.3
<b>Formal Employment</b>		
No	247	82.3
Yes	53	17.7
<b>Living Status</b>		
Alone	38	12.7
With Spouse	107	35.7
With extended family	155	51.7
<b>Economic Status</b>		

Very poor	42	14.0
Poor	196	65.3
Good	62	20.7
<b>Health Insurance</b>		
No	234	78.0
Yes	66	22.0

**Table 1:** Sociodemographic characteristics of respondents.

	Caries n(%)		X <sup>2</sup> , df (P-value)
	No (47.7%)	Yes (52.3%)	
<b>N=300</b>			
<b>Age</b>			
65-69	32(39.0)	50(61.0)	6.16, 4(0.188)
70-74	56(50.0)	56(50.0)	
75-79	32(50.8)	31(49.2)	
80-84	18(62.1)	11(37.9)	
85+	5(35.7)	9(64.3)	
<b>Gender</b>			
Female	79(47.6)	87(52.4)	0.001, 1(0.977)
Male	64(47.8)	70(52.2)	
<b>Location</b>			
Kanjira	43(33.6)	85(66.4)	48.90, 3(<0.001)*
Kateng	35(81.4)	8(18.6)	
Wagwe	43(70.5)	18(29.5)	
Kataa	22(32.4)	46(67.6)	
<b>Education</b>			
No formal education	35(44.3)	44(55.7)	8.95, 3(0.030)*
Primary	76(44.7)	94(55.3)	
Secondary	21(55.3)	17(44.7)	
Tertiary	11(84.6)	2(15.4)	
<b>Formally Employed</b>			
No	110(44.5)	137(55.5)	5.49, 1(0.019)*
Yes	33(62.3)	20(37.7)	
<b>Living Arrangement</b>			

Alone	22(57.9)	16(42.1)	2.25, 2(0.325)
Spouse	52(48.6)	55(51.4)	
Extended	69(44.5)	86(55.5)	
<b>Economic Status</b>			
Good-Very good	37(59.7)	25(40.3)	4.52, 1(0.034)*
Poor-Very poor	106(44.5)	132(55.5)	
<b>Health Insurance</b>			
No	109(46.6)	125(53.4)	0.50, 1(0.478)
Yes	34(51.5)	32(48.5)	

**Table 2:** Distribution of self-reported cavities across sociodemographic characteristics.

	Odds Ratios (95%CI) p-value	
	Model 1: Crude	Model 2: Adjusted*
<b>Brushing daily</b>		
No	Ref	Ref
Yes	3.83(1.80-8.18) <b>0.001**</b>	5.15(2.16-12.17)<0.001**
<b>Toothbrush use</b>		
No	Ref	Ref
Yes	0.18(0.06-0.57) <b>0.003**</b>	0.29(0.08-1.067)0.063
<b>Toothpaste use</b>		
No	Ref	Ref
Yes	4.46(1.45-13.75) <b>0.009**</b>	4.80(1.36-16.97)0.015**
<b>Ever visited dentist</b>		
No	Ref	Ref
Yes	4.78(2.62-8.72)< <b>0.001**</b>	5.91(2.97-11.75)<0.001**
<b>Teeth should be brushed daily</b>		
No	Ref	Ref
Yes	0.82(0.42-1.62)0.575	0.35(0.16-0.78)0.010**
<b>Toothbrush should be changed</b>		
No	Ref	Ref
Yes	0.31(0.16-0.59)< <b>0.001**</b>	0.52(0.25-1.04)0.066
<b>Believe decay is inevitable</b>		
No	Ref	Ref

Yes	1.95(1.10-3.48)0.023**	2.42(1.25-4.69)0.009**
<b>Agrees to Problem-Only dental visit</b>		
No	Ref	Ref
Yes	1.68(0.85-3.30)0.134	2.32(1.10-4.86)0.026**

\*Adjusted for location, education, employment, & economic status. \*\* Significant at P<.05

**Table 3:** Multiple logistic regression models for association between oral hygiene behavior and Self-reported Caries.

#### 4. Discussion

This paper assessed the relationship between dental self-care and self-reported caries among geriatric population in southwestern Kenya. The use of self-report in epidemiological assessment of cavities and related oral morbidities has been validated in a number of studies [23-28]. This method is preferred among epidemiologists due to its relative time and resource leverage [23, 25]. The prevalence of self-reported caries (53.2%) exceeded reports in Colombia [24] and parts of Vietnam [29] indicating greater burden of cavities in the studied population. Indeed considering the possibility of underestimating the true burden of dental caries in self-reports [30], the elderly in the studied area could have had even higher prevalence. Nevertheless, an assessment of dental caries using clinical methods reported prevalence of 49% in parts of Africa [7], which was still lower than reported in this study. In this study, the frequency of brushing with commercial dentifrices (OR=4.80, 95% CI: 1.36-16.97, P=0.015) was associated with higher odds self-reported dental caries before and after adjustment of confounding effect. In extant literature, these habits are reported to prevent dental morbidity [19, 20]. This anomaly could be explained by reverse causality. We argue that in these instances, it was the outcome that caused the exposure.

In a manner of speaking, the elderly in this study were not shy of dental caries until once bitten, reflecting a general poor attitude towards dental self-care. A similar association was observed with dental visit which portended higher odds of self-reported caries across both the crude (OR=4.78, 95% CI: 2.62-8.72, P<.001) and adjusted models (OR=5.91, 95% CI: 2.97-11.75, P<.001). Almoznino and colleagues [21] found dental visit to avert dental caries. However, whereas dental visit in the cited study was prevention-focused, it is likely that respondents in the current study only visited dentists for treatment. As such, it was the dental health problem that caused dental visit resulting in the observed reverse association. A related case-control study reported a similar association between dental visit and caries experience and the authors suggested reverse causality as the plausible explanation [31]. Interestingly, commercial toothbrush was not an independent predictor of caries outcome in the studied population. Its influence was only significant prior to accounting for confounding, conferring about 18% protection. A possible explanation for this could be that this being a low-income rural elderly population, many used other tools to brush their teeth such as chewed sticks as opposed to commercial toothbrush, which have also been found to work well in efficacy assessments [32-

35]. The import of this finding is that it adds to the bolstering evidence justifying traditional brushing tools that are easily accessible to low income populations. Likewise, there were lower odds of self-reported caries associated with knowledge regarding how long toothbrushes should be used (OR= 0.31, 95% CI: 0.16-0.59) but only in the crude model. The influence of this variable was possibly augmented by respondents' socioeconomic status, particularly level of education thus it was not an independent covariate of caries in this study. Respondents with knowledge on brushing frequency were 35% less-likely to report caries in the studied population. Oral health know-how has been documented to improve self-care and avert cavities among the elderly [36] and may have been the reason for this observation. Moreover, believing caries could not be prevented increased the risk of self-reported caries by nearly 3 times (OR =2.42, 95% CI: 1.25-4.69). Poor perceptions could curtail dental self-care resulting in elevated risk of disease [17, 18] and may have been the reason for the observed association. Further, it was observed that acquiescing to dental attendance for treatment only raised the risk of caries by more than twice (OR=2.32, 95% CI: 1.10-4.86). This attitudinal proclivity may have deterred preventive dental attendance reported to avert disease among the elderly [37-39], resulting in elevated incidence of caries.

## 5. Conclusion

This paper assessed the relationship between dental self-care and self-reported caries among geriatric population in southwestern Kenya. The prevalence of self-reported caries was high among respondents. Brushing frequency, aids, dentifrice, literacy and attitudes were associated with caries prevalence. However, dental self-

care habits in this study was largely shaped by caries experience. Respondents' oral hygiene behavior could be described as reactive, in contradistinction to proactive. Targeted interventions to promote proactive oral hygiene behavior among geriatric populations is recommended.

## Limitations and Strengths

The inability of this study to establish a true cause-effect relationship between exposure and outcome variables due to its cross-sectional design should be taken into account in interpreting and applying results. We also notice that the results reflect the unique circumstances of rural Kenya and may not be widely generalized. Nonetheless, this study occupies a unique place in literature, being among the rarities of geriatric oral health research in Africa and possibly the first to report reverse causality in association between certain self-care habits and caries.

## Conflict of Interest

None

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