

Is there Association between Self-reported Dental visits, Tooth Brushing, Fluoride use and Perceived Oral Health Status?

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Abstract

Objectives: Many studies have demonstrated the importance of oral health perceptions in predicting oral health behaviour. Despite the theoretical importance of this concept, the association between self-perceived oral health status and oral health practices has been given relatively little attention in Zimbabwe. The objective of this study was to examine the association between self-reported dental visit, tooth brushing, fluoride use and self-perceived oral health status.

Methods: A cross sectional study was conducted and the information was collected using self-administered anonymous structured questionnaire. The sample included high school students from a boarding school in Zimbabwe. The questionnaire includes items on socio-demographic variables, knowledge of oral health, oral health behaviour and self-perceived oral health status. Self-reported dental visit, tooth brushing and fluoride use were the outcome variables. Perceived health status and selected demographic and oral health variables were taken as explanatory variables. Perceived oral health status was reported as poor, good and excellent.

Result: Multivariable logistic regression revealed that dental visit was associated with self-perceived status of the teeth [OR for excellent teeth=3.8 (95% CI, 1.3, 11.0, p=0.015)] and toothache [OR=2.6 (95% CI, 1.3, 5.2, p=0.005)]. Tooth brushing was positively associated with Age [OR=1.7 (95% CI, 1.1, 2.6, p=0.011)] and self-perceived status of the teeth [OR for excellent teeth=20.6 (95% CI, 2.3, 182.3, p=0.006)]. A significant positive association was observed between fluoride use and self-perceived status of the teeth [OR for excellent teeth = 14.3 (95% CI, 2.3, 89.2, p=0.004)] after controlling for age and fluoride knowledge.

Conclusion: Students with good perceived status of teeth are more likely to have regular dental visit, tooth brushing and use fluorine.

Keywords: Oral health behaviour; Tooth brushing; Dental visit; Fluoride use; Self-perceived oral health; Cross-sectional design; High school students; Adolescents

Abbreviations

CI: Confidence Interval; OH: Oral Health; OHB: Oral Health Behaviour; OR: Odds Ratio

Introduction

Many studies have demonstrated the importance of oral health perceptions in predicting oral health behavior [1-3]. Positive oral health perception may influence an individual's oral hygiene practices and oral health care seeking behavior and may lead the maintenance of optimum oral health [1-3]. The maintenance of optimum oral health is dependent on dental visits, use of tooth brushes, fluorine, dental floss and other appropriate oral care practices [2]. An individual's perception of oral health measures the value attached to oral health and the likelihood of seeking oral care to achieve optimal oral health status [3]. Moreover, perceived oral health is considered a useful measure of outcome because of its relation to the predisposing socio-demographic factors and utilization of dental services [3]. In addition it may provide direction to examine the role of self-perception oral health status in the prevention of dental problems.

Despite the theoretical importance of this concept, the association between self-perceived oral health status and oral health practices has been given relatively little attention in Africa [3]. This is particularly important in areas where poor oral health continues to be one of the most pressing problems among youngsters in general and high school students in particular [4-12]. Addressing the problem and promoting

Oral Health Behavior (OHB) are especially important as students and adolescents face many challenges in preventing dental caries. This oversight will make preventive strategies more difficult and challenging and lead to more expensive and ineffective clinical interventions [8]. Understanding the association is important to inform dentists, parents and oral health experts about appropriate oral health education and preventive strategies. It is anticipated that the results may help to bring light in the design of appropriate OH education for high school students. This is particularly beneficial in areas with limited access to school oral health care as in Zimbabwe. The aim of this study was to examine the association between self-perceived oral health status and selected oral health practices among high school students in Zimbabwe.

Methods

In this study we employed a cross-sectional design to examine the factors associated with selected OHB among Hartzell high school students in the rural community of Old Mutare, Zimbabwe. Hartzell

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is a boarding school with approximately 1300 students. The inclusion criteria were being enrolled in Hartzell High school and being present in class during the survey. The students were selected based on systematic random sampling from the list of all students in the school.

The information was collected using self-administered anonymous structured questionnaires and has three parts, namely, baseline socio-demographic variables, knowledge of oral health and OHB. The baseline variables included age, gender and paternal and maternal educational background. Items that assessed knowledge of oral health were adapted and modified from Petersen et al., Cheah et al., and Gupta et al. [13-15]. The third part included self-perceived oral health status, self-reported regular dental visit and tooth brushing and fluoride use. These questionnaires were adapted and modified from De Palma et al. [16]. The major outcome variables were self-reported tooth brushing, dental visit, and fluoride use and the main explanatory variable was self-perceived status of the tooth. Socio-demographic variables were considered as potential confounders. The data was collected in July 2013. A written consent was obtained from all participating students, the teachers and the principal of the school. Moreover, the students were informed that the information that was collected will be kept confidential and they have a right to withdraw or refuse to participate at any time, without losing any of their rights as a student.

Statistical analysis

Descriptive analysis was made to determine the mean and the standard deviation for numerical variables and percentages for categorical variables. Bivariate analysis was performed to examine differences in oral behavior (self-reported regular brushing vs. non-regular, self-reported regular visit versus non-regular, self-reported fluoride use versus non-use) using Fisher's Exact test for categorical variables and t test for numerical continuous variables. Multiple logistic regressions were used to examine the associations between the outcome variables and relevant dental and demographic explanatory variables. Explanatory variables were selected based on earlier research and univariate regression. Crude association of each explanatory variable was determined to examine its relationship with the outcome variable in univariate models. Upon completion of the univariate analyses, we selected variables for the multivariable analyses. Any variable whose univariate test had a p-value < 0.15 was considered as a candidate for the multivariate model along with variables of known OH importance. Once the variables were identified, they were entered into a multivariable model. The associations were presented as unadjusted and adjusted odds ratios (OR) with 95% confidence intervals (CI). Dependent variables were coded as yes =1 and no =0. The major outcome variables were: self-reported- regular tooth brushing, regular dental visits and fluoride use. Categorical explanatory variables were coded depending on their level. Self-perceived status of teeth has three levels: poor, good and excellent; it was dichotomized as poor and good/excellent. Age was dichotomized as 0 [11-15] and 1 [16-20]. A Variation Inflation Factor greater than 5 was considered as a cut-off criterion for deciding when a given independent variable displayed "too great" a multicollinearity problem. A Cook's distance value (D) > than 1 was taken as a criterion to constitute a strong indication of outlier problems and $D > 4/n$ a criterion to indicate a possible problem, where n was the sample size. Box- Tidwell test was used to determine the linearity to the logit of the outcome variables. The model building procedure and the guidelines for reporting regression analysis have previously been described in detail elsewhere [17,18]. SPSS version 22.0 was used for all data analyses. The level of significance was specified at 0.05. We estimated the sample size based on 5% significance level,

80% power and considering the minimum relevant difference for each outcome variable [6,19]. The optimal number of subjects was taken and 190 students were required for this study.

Results

Main findings

Multivariable logistic regression revealed that dental visit was positively associated with self-perceived status of the teeth [OR for excellent teeth=3.8 (95% CI, 1.3, 11.0, p=0.015)] and toothache [OR=2.6 (95% CI, 1.3, 5.2, p=0.005)]. Tooth brushing was positively associated with Age [OR=1.7 (95% CI, 1.1, 2.6, p=0.011)] and self-perceived status of the teeth [OR for excellent teeth=20.6 (95% CI, 2.3, 182.3, p= .006)]. A significant positive association was observed between fluoride use and self-perceived status of the teeth [OR for excellent teeth=14.3 (95% CI, 2.3, 89.2, p=0.004)].

Results

A total of 199 students between 11 to 20 years were involved in the study. The mean age was 14.7 (SD=2.4). Of the 199 students 125 (62.8%) were females. Of the total participants 92.5% stated that their teeth are very important to them. More than half of the students (56.8%) described their oral health status as good, 13.6% depicted it as poor and 27.6% claimed it as excellent. Nearly two thirds of the students (65.3%) did not visit the dentist regularly. Amongst the students claiming that they visited on a regular basis, 19.6% of them stated pain as a main incentive to visit the dentist. The majority of the students (89.9%) reported that they brush their teeth regularly. A total of 74.4% brushed their teeth twice or more than twice a day. The majority of the students (90.5%) were aware of fluoride and 73% also used it. The most commonly used fluoride type was fluoride toothpaste (53.3%).

Knowledge

More than 85% of the students (85.4%) knew what caries was and 87.9% were aware that bacteria cause caries. A total of 84.9% knew that drinking and eating sweet cause caries and 84.9% knew that regular tooth brushing prevents tooth decay and gum disease. A substantial portion (80.9%) was aware that gum bleeding while brushing might be a sign of gum disease. More than half of the students (56.8%) did not know what dental floss was. Frequency of meal, consumption of sugar-containing products, knowledge about caries and its causes were not statistically significant predictors of the major outcome variables. Multivariable logistic regression did not reveal significant association between knowledge and all the outcome variables.

Bivariate analysis of the major outcome variables (regular visit, regular brushing fluoride use) were examined with the following explanatory variables: age, sex, perceived condition of teeth, and fluoride knowledge. The results are presented in Tables 1-3.

Fluoride use

Table 1 presents the variables associated with fluoride use. The proportion of fluoride use was statistically significantly higher among students who perceived their teeth as good or excellent (p<0.01), had reported regular tooth brushing (p<0.01), know what fluoride is (p<0.001), and dental floss is (p<0.05). The mean age of fluoride users was statistically significant higher ((p<0.001). Multivariate logistic regression analysis revealed a significant positive association between fluoride use and age [OR=1.6 (95% CI, 1.1, 2.2, p=0.02)], fluoride knowledge [OR=14.9 (95% CI, 2.3, 97.5, p=0.005)] and [OR for excellent teeth=14.3 (95% CI, 2.3, 89.2, p=0.004)] (Table 4).

Variable	Fluoride users n=120 n(%)	Non users n=19 n(%)
Age, year, Mean(SD)	15.7 (2.3)	13.0 (1.4)***
Sex, female, (%),	78/120 (65)	11/19 (58)
Maternal education ^b , yes	79/114 (69)	15/17 (88)
Paternal education ^b , yes	63/114 (55)	10/18 (57)
Self-perceived status, good ^c , (%)	108/118 (92)	12/19 (63)**
Regular dental visit, yes, (%)	42/119 (35)	11/19 (58)
Regular tooth brushing, yes, (%)	115/118 (98)	15/19 (80)**
Fluoride knowledge, yes, (%)	114/119 (96)	11/18 (61)***
Toothache, yes, (%)	59/119 (50)	11/19 (58)

*p < 0.05 **p<0.01 ***p<.001

^a = n may not be equal to the denominator because of legitimate escape or missing values.

^b = University level

^c = Self-perceived status of the teeth, "good" includes both good and excellent categories

Table 1: Bivariate analysis of variables by self-reported fluoride use.

Variable	Regular visitor ^a n=67	Not visitor ^a n=130
Age, year, Mean(SD)	14.4 (2.2)	14.9 (2.4)
Sex, female, (%),	38/67 (57)	86/139 (66)
Maternal education ^b , yes	53/64 (83)	86/121 (71)
Paternal education ^b , yes	42/65 (55)	67/121 (55)
Self-perceived status, good ^c , (%)	58/67 (87)	110/128 (86)
Fluoride use, yes, (%)	42/53 (79)	77/85 (91)
Regular tooth brushing, yes, (%)	60/65 (92)	118/128 (92)
Fluoride knowledge, yes, (%)	47/61 (72)	77/125 (62)
Toothache, yes, (%)	41/66 (62)	60/129 (47)*

*p < 0.05

^a = n may not be equal to the denominator because of legitimate escape or missing values.

^b = University level

^c = Self-perceived status of the teeth, "good" includes both good and excellent categories

Table 2: Bivariate analysis of variables by self-reported regular visit.

Variable	Regular visitor ^a n=179	Not visitor ^a n=15
Age, year, Mean(SD)	15.0 (2.2)	12.9 (2.4)**
Sex, female, (%),	112/179 (63)	8/15 (53)
Maternal education ^b , yes	129/170 (76)	9/12 (75)
Paternal education ^b , yes	99/170 (58)	10/13 (77)
Self-perceived status, good ^c , (%)	157/176 (89)	7/15 (47)***
Fluoride use, yes, (%)	115/130 (86)	3/7 (43)**
Regular tooth brushing, yes, (%)	60/178 (34)	5/15 (33)
Fluoride knowledge, yes, (%)	118/173 (68)	5/14 (36)*
Toothache, yes, (%)	91/177 (51)	7/15 (47)

*p < 0.05 **p<0.01 ***p<.001

^a = n may not be equal to the denominator because of legitimate escape or missing values.

^b = University level

^c = Self-perceived status of the teeth, "good" includes both good and excellent categories

Table 3: Bivariate analysis of variables by self-reported regular tooth brushing.

Dental visit

Bivariate analysis of variables associated to regular visit indicated that only toothache was statistically significantly (OR, 1.9 (1.03, 3.5), p <0.05) (Tables 2 and 4). However, multivariate logistic regression analysis revealed that self-perceived status of the teeth [OR for excellent teeth=3.8 (95% CI, 1.3, 11.0, p=0.015)] and toothache [OR=2.6 (95% CI, 1.3, 5.2, p=0.005)] were associated with regular dental visit (Table 4).

Tooth brushing

The proportion of regular tooth brushing was statistically significantly higher in older students (p<0.01), subjects who perceived their teeth as good or excellent (p<0.001), had reported knowledge of fluoride (p<0.01), and use of fluoride (p<0.05) (Table 3). Only age [OR =1.7 (95% CI, 1.1, 2.6, p=0.011)] and self-perceived status of the teeth [OR for excellent teeth=20.6 (95% CI, 2.3, 182.3, p=0.006)] remained statistically significant after adjustment with multivariable logistic regression (Table 4).

Perceived condition of the teeth dichotomized as poor and good/excellent was significantly associated with age group (p=0.006, Fischer's exact test, two sided). Multivariable logistic regression analysis revealed that the dependent variable perceived condition of the teeth was associated with age [OR for age group=3.9 (95% CI, 1.4, 10.9, p=0.008)] but not sex (OR=0.78 (95% CI, .32, 1.9, p=0.57)) (Table 5).

We did not observe multicollinearity or outlier problem. Box-Tidwell test indicated that there is linearity to the logit of the outcome variables.

Discussion

This study was intended to examine the association between self-reported dental visit, tooth brushing, fluoride use and perceived oral health status among high school students in Zimbabwe. We have observed a positive association between age, fluoride knowledge and perceived status of the teeth with fluoride use. Toothache and "excellent" self-perceived status of the teeth were positively associated with self-reported regular dental attendance. Age and self-perceived status of the teeth were also positively associated with self-reported regular tooth brushing.

Variable	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Regular dental visit		
Toothache	1.9 (1.03, 3.5) *	2.6 (1.3, 5.2)**
Self-perceived status (excellent)	2.1 (0.80, 5.4)	3.8 (1.3, 11.0)*
Self-perceived status (good)	0.7 (0.29, 1.8)	1.03 (0.4, 2.7)
Self-perceived status (poor)	Reference	
Regular tooth brushing		
Age	1.8 (1.2, 2.6)**	1.7 (1.1, 2.6)*
Self-perceived status(excellent)	22.3 (2.6, 190.4)**	20.6 (2.3, 182.3)**
Self-perceived status (good)	7.3 (2.3, 23.4)**	5.4 (1.6, 18.3)**
Self-perceived status (poor)	Reference	
Fluoride use		
Age	1.9 (1.4, 2.7)***	1.6 (1.1, 2.2)*
Fluoride knowledge, yes	14.5 (3.9, 53.4)***	14.9 (2.3, 97.5)**
Self-perceived status (excellent)	8.9 (2.5, 32.1)**	14.3 (2.3, 89.2)**
Self-perceived status (good)	3.6 (.98, 13.3)*	5.4 (1.6, 18.3)**
Self-perceived status (poor)	Reference	

*p ≤ 0.05 **p<0.01 ***p<.001 OR = Odds ratio CI = Confidence interval Note: Reported regular tooth brushing and reported regular visit

Table 4: Results of logistic regression for the dependent variables self-reported regular dental visit, regular tooth brushing and fluoride use.

Variable	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Sex Reference (Male)	.81 (.34, 1.9)	.78 (.32, 1.9)
Age group (16-20) Reference (11-15)	3.9 (1.4, 10.8)**	3.9 (1.4, 10.9)**

**p<0.01 OR = Odds ratio CI = Confidence interval

Table 5: Results of logistic regression for the dependent variable self-perceived oral health status.

An underlying mechanism suspected to be influential in OHB is own perception of OH, which posits that individuals are more likely to develop healthy OHB when they perceive their OH as good or excellent [20,21]. Similar outcome was observed by Jiang et al. in which Chinese adolescent also reported mostly positive oral health self-perception [20]. A recent article [21] underlined the importance of perception than previously assumed. The positive attitude of the students in the importance of their teeth might influence the OHB, which should be utilized in planning preventive oral health promotion programs.

In this study, we found that age but not sex was associated with perceived oral health status as excellent/good or poor. We hypothesized that perceived dental status is more important for older compared to younger students but equally important for both sexes. This may suggest that self-perception of dental appearance is an important feature in determining the self-rating dental aesthetics or satisfaction with one's appearance [22], and simultaneously may play a key role in promoting OHB. It is interesting to note that students, who rated excellent/good about their oral health status, reported higher proportion of oral health care practices essential for maintaining good oral health (Iwuala). However, understanding the role of perception among students and how they affect OHB is complex. The detailed mechanisms of the role of perceptions are less understood and need to be clarified in the future.

Although OH was important to most of the students, only 35% reported regular dental visits. This finding was in agreement with a study done among African university students [6]. Interestingly, in our study the prevalence of dental visit was low despite other positive OHBs - high proportion of regular tooth brushing and frequent teeth cleaning. Seemingly contradictory findings related to OHB were also observed by Mafuvadze in Zimbabwe [7] among Zimbabwean school children.

About three-fourth of the students brushed their teeth twice a day or more. These findings are comparable to those of Vakani in Karachi showed that 74% of the 12 year olds brushed their teeth two times a day or more than twice a day [23]. But Humagain et al. [24], reported only 35% brushed regularly among secondary school students in Nepal [25]. After adjusting for relevant dental and socio-demographic variables, the current study findings indicate positive association between regular tooth brushing and age and perceived condition of the teeth. This finding is largely consistent with findings of previous research [6]. However, in contrast with a number of other studies [6,25-27] our study did not show statistically significant gender association with regular tooth brushing and regular dental visit.

In multivariable logistic regression being older student, having knowledge about fluoride and perception of the condition of the tooth as excellent were associated with fluoride use. Other researches have reported similar findings that oral health knowledge contributes to improvement in OHB [28]. Contrary to previous findings [6], we did not observe statistically significant relationship between knowledge and self-reported regular tooth brushing and dental attendance.

In general it seems that oral health perception may influence an individual's oral hygiene practices and oral health care seeking behaviour [1-3,29,30]. This viewpoint emphasizes student perceptions about their OH and how they view their oral health status affect their OHB. This means that oral health practices are not only related to oral health knowledge but it is multifactorial. Self-perception of oral health may be influenced by one's own experiences, cultural values, familial practice, and beliefs and might in turn influence the oral health behaviour of an individual [31-33]. This study presupposes perceptions related to OHB

to be an important factor which affects OH use. This presupposition draws attention to student's perception of oral health status which may play an important role in understanding different behaviours related to OH practice. It seems that perceptions on oral health status have influence on OHB. An individual's behaviour can, in other words, be seen as influenced by perceptions. This viewpoint emphasizes student perceptions and how they view their oral health status affect their OH behaviour. Therefore, comprehensive understanding of self-perception may be important when exploring factors influencing OHB. But there is a need for a more rigorous methodological approach in researching OH behaviour that enables a thorough examination of the oral health perception of marginalised adolescents.

The results should be interpreted with caution, given the study's several limitations. Perception questions and toothache can be deceptive and rely on the student's own interpretations and personal experiences. The investigation was carried out with students from one high school and cannot be generalized to the younger segment of the population. The sample had a larger proportion of females, which may have biased the results. Self-reported OH status may not be as accurate as an oral exam performed by a dentist or dental hygienist. Thus, it is possible that the proportions of oral health behaviours were under- or overestimated. However, researchers found reports of dental health status to be relatively accurate when compared to dental examination [6,21,34]. Further, the assessment of oral health behavior was limited to tooth brushing, dental attendance, knowledge, frequency of brushing, and 'sugar behavior' and did not include other oral hygiene [6,35] and oral health status items. These should be assessed in future studies. Moreover, as this is a cross-sectional study, causality is not implied. Students who were sick and absent were not included though they were few and prior information to teachers might have reduced the number of children. Despite these limitations, the results of the present study provide valuable information that may contribute to the enhancement of prevention oriented oral health education. To move towards a more promising preventive strategy, school leadership and parents need to consider factors that promote OH prevention and promotion [36].

In summary our results imply students with poor perception of their oral health status are less likely to have self-reported regular dental visit, regular tooth brushing and use fluoride. Thus our results suggest that positive perceived oral health status may be important in promoting oral health in the target group. It is anticipated that the results may help to bring light in the design of appropriate OH educational programs. This is particularly beneficial in areas with limited access to school oral health care as in Zimbabwe.

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