

Research article

Oral health behavior patterns among Tanzanian university students: a repeat cross-sectional survey

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Abstract

Purpose: This study examines oral health behavioral trends and the development of sociodemographic differences in oral health behaviors among Tanzanian students between 1999 and 2000.

Methods: The population targeted was students attending the Muhimbili University College of Health Sciences (MUCHS) at the University of Dar es Salaam (UDSM), Dar es Salaam, Tanzania. Cross-sectional surveys were conducted and a total of 635 and 981 students, respectively, completed questionnaires in 1999 and 2001.

Results: Cross-tabulation analyses revealed that in 1999, the rates of abstinence from tobacco use, and of soft drink consumption, regular dental checkups, and intake of chocolate/candy were 84%, 51%, 48%, and 12%, respectively, among students of urban origin and 83%, 29%, 37%, and 5% among their rural counterparts. The corresponding rates in 2001 were 87%, 56%, 50%, and 9% among urban students and 84%, 44%, 38%, and 4% among rural ones. Multiple logistic regression analyses controlling for sex, age, place of origin, educational level, year of survey, and their interaction terms revealed a significant increase in the rate of soft drink consumption, implementation of oral hygiene measures, and abstinence from tobacco use between 1999 and 2001. Social inequalities observed in 1999, with urban students being more likely than their rural counterparts to take soft drinks and go for regular dental checkups, had leveled off by 2001.

Conclusion: This study provides initial evidence of oral health behavioral trends, that may be utilized in the planning of preventive programs among university students in Tanzania.

Background

In socioeconomically developing countries, the change from a traditional lifestyle to a Western lifestyle has, among other things, led to an increase in sugar consumption from food and beverages, and in the form of chocolate/candy [1]. Higher caries prevalence is anticipated

following increased consumption of sugar especially since for the majority, fluoridated toothpaste is not easily available. In Tanzania, liberalization of trade links with industrialized countries has brought about imports of greater quantities of sugar; also, commercialized sugar products have increasingly gained social importance [2].

There is evidence suggesting that commercialized sugar products are very popular, particularly among affluent urban residents. Moreover, a marked decline in the sale of tobacco in the industrialized world seems to have been compensated by a rapid development of a new generation of smokers in sub-Saharan Africa [3]. In recent years, smoking has become fashionable and an increasing number of smoking women is anticipated. Researchers' and the general public's opinion about the developmental patterns of tobacco use and sugar intake appears, however, based more on anecdote than on scientific evidence. So far, few systematic data are available on health behavioral trends among the people of Tanzania and its neighboring countries.

Although behavioral research with relevance to health is scarce in sub-Saharan Africa, some studies, commonly of cross-sectional design, have been undertaken during the past 10–15 years. Today still, moderate numbers of youth confirm daily intake of commercialized sugar products [4–7]. Contrary to what has been observed in occidental studies [8], female and urban respondents report snacking of sugared foods and drinks more frequently than do their male and rural counterparts [9]. Recent studies of adolescents in Tanzania and Zimbabwe have yielded lifetime prevalence rates of tobacco use, ranging from 0.4% to 12% and from 12% to 27% in females and males, respectively [10,11]. In a repeat cross-sectional study of Nigerian university students, Adelekan et al. [12] report on a decline in lifetime prevalence use of cigarettes from 37% in 1988 to 21% in 1993. Flisher et al. [13] report on a prevalence of current smoking of 18% among high-school students in the Cape Peninsula, Cape Town, South Africa. Surveys of adolescents and young adults have shown that the majority of them, and more females than males, engage in daily tooth cleaning [4,5]. Mosha and Scheutz [14] report a lifetime prevalence of regular dental checkups in the general adult Tanzanian population, amounting to 51% among men and 43% among women.

Statistics on change in oral health-related behaviors across time may provide a valuable tool in the planning, implementation, and evaluation of oral health promotion programs. Just as important, from an oral health educational point of view, is information regarding the socioeconomic and regional distribution of oral health-related behaviors. A basic principle in the diffusion of new lifestyles is the spread from higher to lower socioeconomic status groups, from people with higher education to the less educated, and from people exposed to mass media to those who are not exposed or who are less exposed [15]. In sub-Saharan Africa, university students constitute a relatively homogenous, socially affluent group within the general adult population. As such, they are important as early adopters of new ideas and West-

ern lifestyles. This study aims to examine trends in oral health-related behavior among university students in Tanzania and to study the development of socioeconomic and regional differences in students' oral health-related behaviors between 1999 and 2001.

Methods

Sample and data collection

The present analyses are based on data from two consecutive cross-sectional surveys undertaken at the Muhimbili University Colleges of Health Sciences (MUCHS) at the University of Dar es Salaam (UDSM), Dar es Salaam, Tanzania. In each survey year, all students enrolled at four faculties. Medicine, Dentistry, Nursing, and Pharmacy (i.e., at higher degree level) and at the Institute of Allied Health Sciences (i.e., at lower degree/diploma level) were invited to participate. In 1999 and 2001, the MUCHS enrolled a total of 1000 and 1065 students, respectively, of which 635 and 981, respectively, participated, and returned satisfactory data. The total response rates varied from 64% (37% females) in 1999 to 92% (33% females) in 2001 (see sample profile, Table 1). In 1999, data were collected from May to July whereas in 2001, the data collection took place earlier in the year, viz. from March to May. Non-response in 1999 was mainly due to the fact that many students were writing final exams at the time when the survey was conducted. The data were collected anonymously, through self-completion questionnaires in English, the medium of instruction at all higher learning institutions in Tanzania. The questionnaires were peer-reviewed for content validity and revised before the data collection began. The questionnaires were administered in ordinary classroom settings and supervised by trained Tanzanian research staff. The survey instrument was adapted from that developed by the Tanzanian adult morbidity and mortality project [16], and from survey instruments previously tested in Tanzania [5]. Informed consent was requested from each participant and ethical clearance was obtained from the research and ethical committee at the UDSM. In 1999, a retest of the whole survey instrument was undertaken among 33 participants after an interval of 15 days.

Measures

Ever used tobacco products was assessed using the response categories (1) "No", (0) "yes". Consumption of soft drinks, chocolate/candy, and sugared coffee/tea and use of toothpicks were assessed on a 6-point scale, where (1) = "more than once a day", (2) = "once a day", (3) = "3–6 times a week", (4) = "1–2 times a week", (5) = "rarely", and (6) = "never". Frequency of dental checkups was assessed on a 4-point scale, with (1) = "twice a year", (2) = "once a year", (3) = "rarely", and (4) = "never". For cross-tabulation and logistic regression analysis, dummy vari-

Table 1: Frequency distribution of participants by sociodemographic characteristics and survey year.

	1999 n = 635 ^c (%)	2001 n = 981 ^c (%)
Higher degree students ^a	367 (58)	654 (66)
Lower degree/diploma students ^b	268 (42)	336 (34)*
Females	236 (37)	327 (33)
Males	399 (63)	654 (67)
Age: 19–25 yrs	444 (71)	585 (61)**
Age: >25 yrs	181 (29)	368 (39)
Raised in an urban environment	421 (67)	617(63)
Raised in a rural environment	207 (33)	358 (37)

^aMedicine, Dentistry, Nursing, and Pharmacy; ^bAllied Health Sciences; ^cThe total number in the different categories do not add up to 635 and 981 due to missing values. * $P < 0.05$; ** $P < 0.001$.

ables were constructed yielding the categories (1) "at least several times a week", and (0) "rarely/never" with respect to consumption of sugared snacks and drinks. Use of toothpicks and frequency of dental checkups were dichotomized yielding the categories (1) "at least daily" and (0) "less than once a day", and (1) "at least once a year" and (0) "less than once a year", respectively. Demographic information included sex: (1) female or (2) male; place of origin: (1) city/town or (2) village/rural; age at last birthday: (1) 19–25 years or (2) >25 years; educational level: (1) lower degree/diploma (Institute of Allied Health Sciences) or (2) higher degree (faculties of Medicine, Dentistry, Pharmacy, and Nursing).

Analyses

Cross-tabulation analyses and chi-square statistics were used to assess bivariate relationships between oral health-related behavior and sociodemographic characteristics (age, sex, educational level, and place of origin). Time trends, from 1999 to 2001, were estimated using logistic regression analyses with year of data collection as a categorical variable and by calculating the average odds ratio (OR) for the 2-year survey period. Stepwise multiple regression analyses were performed using the logit model, with 95% confidence intervals (CIs) given for the ORs indicating statistically significant relationships if both values are either greater or less than 1. All independent variables, survey year (1999/2001), age, sex, place of origin, and educational level, and their corresponding interaction terms were checked by logistic regression analysis. The significance of adding a variable or an interaction term into the model was tested with Pearson's chi-square test ($P < 0.05$).

Results

The sex distribution differed significantly with age, place of origin, and educational level within each survey year ($P < 0.001$). As summarized in Table 1, the 1999 and 2001 samples were relatively homogenous although significantly higher proportions of students surveyed in 2001 as compared with those surveyed in 1999 were 19–25 years old and enrolled at educational institutions offering higher degree courses ($P < 0.001$).

Tables 2 and 3 show the differences in oral health-related behaviors between urban and rural, and female and male, students in 1999 and 2001. In 1999, most students reported total abstinence from tobacco use (84% urban versus 83% rural) and weekly intake of sugared coffee/tea (91% urban versus 90% rural). Intermediate proportions reported going for dental checkups at least once a year (48% urban versus 37% rural; $P < 0.05$), use of oral hygiene measures (i.e., toothpicks) weekly (52% urban versus 48% rural), and weekly soft drink consumption (51% urban versus 29% rural; $P < 0.001$). Only a minority reported weekly intake of chocolate/candy (12% urban versus 5% rural; $P < 0.05$). Consistent patterns of oral health-related behaviors emerged in 2001. Comparing the area and gender-specific rates, the relationships found at the area level were generally maintained at the gender subgroup level.

Multiple logistic regression analysis controlling for sex, age, place of origin, educational level, and survey year, and their interaction terms showed significant main effects in terms of OR and 95% CIs of most independent variables of the oral health-related behaviors considered (Tables 4,5). The 2-year trend for the study group as a whole showed a significant increase in the rate of soft drink consumption, use of toothpicks, and abstinence from tobacco use as well as a significant decrease in the rate of sugared coffee/tea consumption. As compared with 1999 (OR = 1), the adjusted ORs in 2001 were 1.3 (95% CI 1.1–1.6), 1.5 (95% CI 1.1–1.9), 1.6 (95% CI 1.3–1.9), and 0.6 (95% CI 0.4–0.7) for soft drinks, abstinence from tobacco, use of toothpicks, and intake of sugared coffee/tea, respectively.

Significant second-order effects on *soft drink consumption* in terms of regression coefficients (B) were shown for the terms survey year by place of origin (B = 0.56; $P < 0.05$) and survey year by age group (B = 0.53; $P < 0.05$). Probing the results of logistic regression analysis in each survey year highlighted the nature of the interaction terms. The OR for urban students as compared with students from a rural area (OR = 1) decreased from 2.7 (95% CI 1.8–4.0) in 1999 to 1.6 (95% CI 1.2–2.1) in 2001. Compared with 1999 (OR = 1), the ORs for taking soft drinks in 2001 were 1.1 (95% CI 0.8–1.4) and 2.0 (95% CI

Table 2: Frequency distribution (percentage %) of students by weekly intake of soft drinks, sugared coffee tea, and chocolate/candy and by place of origin and sex, 1999–2001.

	Urban			Rural		
	Total	Female	Male	Total	Female	Male
1999	n = 421 (%)	n = 185 (%)	n = 236 (%)	n = 207 (%)	n = 48(%)	n = 159(%)
Soft drinks	216(51)	89 (49)	127 (53)	59 (29)**	20 (42)	39 (25)*
Sugared coffee/tea	382 (91)	163 (88)	219 (93)	187 (90)	44 (92)	143 (90)
Chocolate/candy	50 (12)	37 (20)	13 (6)**	11 (5)*	4 (6)	7 (5)
2001	617 (%)	226 (%)	391 (%)	358 (%)	98 (%)	260 (%)
Soft drinks	341 (56)	126 (56)	215 (55)	154 (44)**	46 (43)	111 (43)
Sugared coffee/tea	509 (83)	179 (79)	330 (85)	314 (88)*	84 (82)	232 (90)
Chocolate/candy	57 (9)	35 (16)	22 (6)**	16 (4)*	8 (8)	8 (3)*

*P < 0.05, **P < 0.001.

Table 3: Frequency distribution (percentage %) of students reporting total abstinence from tobacco use, weekly use of toothpicks, and annual dental checkups by place of origin and sex, 1999–2001.

	Urban			Rural		
	Total n = 421 (%)	Female n = 185 (%)	Male n = 236 (%)	Total n = 207 (%)	Female n = 48 (%)	Male n = 159 (%)
1999						
Never use tobacco	352 (84)	179 (97)	173 (74)**	169 (83)	45 (98)	124 (79)*
Toothpicks	217 (52)	99 (54)	118 (50)	98 (48)	27 (57)	71 (45)
Dental checkups	203 (48)	112 (61)	91 (38)**	76 (37)*	24(51)	52 (32)*
2001	617 (%)	226 (%)	391 (%)	358 (%)	98 (%)	260 (%)
Never use tobacco	523 (87)	209 (95)	314 (81)**	297 (84)	94 (96)	203 (80)**
Toothpicks	375 (62)	129 (58)	246 (63)	219 (63)	52 (55)	167 (66)
Dental checkups	302 (50)	135 (60)	167 (43)**	135 (38)**	57 (58)	78 (30)**

*P < 0.05; **P < 0.001.

1.4–2.9) among urban and rural-origin students, respectively. The OR for the 19–25-year-olds (reference category: >25 years old) changed from 1.2 (95% CI 0.8–1.9) in 1999 to 0.7 (95% CI 0.5–0.9) in 2001. Finally, the ORs for soft drink consumption in 2001 (reference category: 1999) was 1.9 (95% CI 1.2–2.8) among students above 25 years old. Among the 19–25-year-old students, there was no significant change in soft drink consumption between 1999 and 2001.

Significant second-order effects on *chocolate/candy consumption and dental checkups* were observed for the terms survey year by age (B = 1.4; P < 0.05) and survey year by educational level (B = 0.5; P < 0.05). Separate regression analyses in each survey year showed a reversal of the age distribution of chocolate/candy consumption

between 1999 and 2001. The ORs for 19–25-year-olds (reference category: >25 years old) changed from 1.5 (95% CI 0.7–3.5) in 1999 to 0.2 (95% CI 0.2–0.5) in 2001. The OR for dental checkups at least once a year in students taking higher degree courses (reference category: lower degree/diploma students) changed from 1.7 (95% CI 1.2–2.5) in 1999 to 0.9 (95% CI 0.7–1.2) in 2001.

Discussion

This paper documents the development of oral health-related behaviors and their sociodemographic distribution across time focusing on a non-occidental study population. Methodological strengths of the present study include the large sample size, the availability of comparable survey instruments, the sampling strategies and methods of data collection, and also, the diverse nature

Table 4: Adjusted odds ratios (ORs) and 95% confidence intervals (CIs) for students' intake of soft drinks, chocolate/candy, and sugared coffee/tea, and use of toothpicks, according to sex, place of origin, age, educational level, and year of survey.

	Soft drinks		Chocolate/candy		Coffee/tea		Toothpicks	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Sex								
Female vs male	1.3	1.1–1.6	4.1	2.8–6.1	0.6	0.5–0.8	1.0	0.7–1.4
Age								
19–25 yrs vs >25 yrs	0.9	0.7–1.1	0.5	0.3–0.8	0.9	0.6–1.2	1.1	0.8–1.3
Place of residence								
Urban vs rural	1.9	1.5–2.4	2.1	1.3–3.3	0.8	0.6–1.3	1.0	0.8–1.3
Educational level								
Higher vs lower	2.8	2.1–3.4	1.7	1.1–2.5	0.7	0.5–0.9	1.5	1.2–1.9
Survey year								
2001 vs 1999	1.3	1.1–1.6	0.7	0.7–1.1	0.6	0.4–0.7	1.6	1.3–1.9

Model chi-square (df): Soft drinks $\chi^2 = 131.6$ (5); $P < 0.001$. Chocolate/candy $\chi^2 = 72.0$ (5); $P < 0.001$. Sugared coffee/tea $\chi^2 = 27.7$ (5); $P < 0.001$. Toothpicks $\chi^2 = 31.8$ (5); $P < 0.001$.

of the various oral health-related behaviors. A repeat cross-sectional survey, with the same target population and sampling frame, is the most appropriate and straightforward design for providing a series of survey estimates by which changes in a population can be monitored over periods of time [17]. Trend studies of oral health-related behaviors, using a repeat cross-sectional design, have previously been reported mainly from the developed countries [18]. This study design, although scientifically less rigorous than that of longitudinal studies, has been widely advocated by the United Nations, particularly in countries with limited resources [19]. In the present study, data were gathered at different points in time from the same population, but not from the same individuals. Whereas a census survey was conducted in 2001, as intended, the analyzed data represent 64% of the intended sample in 1999. Lack of information about non-respondents precludes any conclusion about a possible selection bias, although the response rates seem to be high enough to ensure that the target population is reflected with a reasonable degree of accuracy. However, these estimates call for careful interpretation as the observed change may be due to differences between the samples rather than representing a true change in the population of MUCHS students.

The findings of the two surveys confirm that self-reported snacking of sugared food and drinks and dental attendance behavior were highest among females, higher degree students, and students of urban origin, thus corroborating previous studies of community populations in sub-Saharan African countries [4,9,10]. The present findings related to consumption of commercialized sugar

products are in contrast to those reported from industrialized countries where the highest prevalence of sugar consumption has been observed among males and individuals of lower socioeconomic status [18]. Previous research in both occidental and non-occidental populations has, however, demonstrated positive associations between reported self-care practices (e.g., going for dental checkups) and socioeconomic status, with the more affluent behaving more healthily than the less affluent [4,18,20]. In Tanzania, the cost-sharing policy implemented to ensure equity in access to modern health care services has not yet introduced user fees for services delivered by government-run oral health clinics [21]. Since the government's health facilities are known to have shortages of drugs and other essential equipment, many seek care from private facilities where charges for services are high and there is no exemption system [22]. Although university students have access to a free dental service at the MUCHS, we found that students of rural origin were less likely to visit dentists than were their urban counterparts. It is possible that students from a rural background and lower socioeconomic status were less likely to go for regular dental checkups because they could not afford to pay for the private care services. Consistent with other studies conducted in sub-Saharan Africa, more females than males reported abstinence from smoking across both survey years [4,12]. One reason may be that the Tanzanian society still frowns upon tobacco use among women. This contrasts with the recent trends being reported from developed countries, where females are more frequent, and heavier, smokers than males [23,24].

Table 5: Adjusted odds ratios (ORs) and 95% confidence intervals (CIs) for students' dental checkups and reported abstinence from tobacco products, according to sex, place of origin, age, educational level, and year of survey.

	Dental checkups		Never use of tobacco	
	OR	95% CI	OR	95% CI
Sex				
Female vs male	2.5	2.0–3.1	6.8	4.2–11.2
Age				
19–25 yrs vs >25 yrs	0.9	0.7–1.2	1.6	1.6–2.2
Place of residence				
Urban vs rural	1.5	1.2–1.9	1.0	0.7–1.3
Educational level				
Higher vs lower	1.2	0.9–1.5	0.6	0.4–0.8
Survey year				
2001 vs 1999	1.0	0.9–1.3	1.5	1.1–1.9

Model chi-square (df): Dental checkups $\chi^2 = 85.2$ (5); $P < 0.001$. Abstinence from tobacco $\chi^2 = 121.3$ (5); $P < 0.001$.

The two data sets from two surveys allowed us to examine changes that had taken place between 1999 and 2001. The results point to a general increase in the consumption of commercialized sugar products (e.g., Coca-Cola), whereas a commensurate decrease appears to have occurred with respect to the more traditional habit of taking sugar in coffee and tea. Interestingly, the regional differences in soft drink consumption, with urban students taking more soft drinks on a weekly basis than rural students, decreased markedly across the survey period. There was in fact a more pronounced increase in soft drink consumption among students raised in rural areas than among students from an urban background. Second-order effects from multiple logistic regression analyses revealed that the age differences in soft drink consumption changed from 1999 to 2001, with younger (19–25-year-old) students being the most frequent consumers in 1999 and older students (>25 years) being the most frequent consumers in 2001. Stratified analyses revealed this to be primarily a consequence of a pronounced increase in soft drink consumption among the older students. Contemporary consumption of commercialized sugar products is recognized to be closely associated with Western lifestyles, portrayed through the mass media and demonstrated in practice by acculturated segments of the Tanzanian population. Evidently, soft drink consumption is already established and is still on the increase among university students in Tanzania. The pronounced increase among students above 25 years old and students of rural origin may be interpreted as diffusion from higher to lower socioeconomic strata within this particular segment of the Tanzanian population [15]. Contrary to what could be expected from an economic transitional point of view, the present analysis points to

a general increase in reported total abstinence from tobacco use between 1999 to 2001.

The observed trend of an increase in oral hygiene measures and abstinence from tobacco among both sexes would suggest that the oral health education program in Tanzania's media is effective. This program targets mainly the urban population, of which university students constitute an important part. The finding that women are less likely than men to be informed by the mass media due to the Tanzanian sociocultural context [25] was not supported by the present study. Our finding and the observed decline in the social disparity between students of higher and lower degree with regard to dental checkup patterns between 1999 and 2001, corroborates the WHO target to achieve reduction in health inequalities between groups within countries by the year 2000 [26].

Since the present results rely on self-reported data, the rates of oral health behaviors may be biased through over- and underreporting due to social desirability and poor recall effects. Nevertheless, test-retest reliability of the oral health-related behaviors was examined in 1999 and found to be satisfactory [27]. There is no reason to suspect changes in the accuracy of self-reported oral health behaviors across the survey period. Given this, the reported change, and lack of change, in students' oral health-related behaviors is likely to be reasonably accurate.

In summary, the present analysis suggests an increasing trend in the proportion of Tanzanian university students reporting abstinence from tobacco products, weekly con-

sumption of commercialized sugar products, and implementation of oral hygiene measures from 1999 to 2001. Across the survey period, a decline was seen in the social disparity with regard to soft drink consumption (urban-rural) and dental checkup (educational level) patterns. In spite of some compatibility problems, this study represents the first opportunity to approach trends in a sub-national population of Tanzanian adults. A third data collection will be necessary in 4–5 years' time to generate more conclusive trend data for use by health workers and policy makers in planning preventive oral health programs.

Competing interests

None declared.

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