

Self-reported dental pain and associated factors in Ugandan schoolchildren

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ABSTRACT

There is a limited amount of research on the prevalence and determinants of subjective oral health indicators in children. **Objective:** to assess the prevalence of self-reported dental pain and to explore its relationship with socio-demographic characteristics in 10-14 year olds attending primary schools. **Method:** A cross-sectional survey was conducted during January-March 2004, including 11 public primary schools in Kampala, Uganda. A total of 614 children completed questionnaires administered in schools. Dental caries and plaque status were recorded in permanent teeth. **Results:** Experience with dental pain was confirmed by 42.1% boys and 52.3% girls. The crude prevalence of dental caries was 37.9% in boys and 42.1% in girls. Plaque was present on anterior teeth and 84.3% complained of at least one oral problem. Multiple logistic regression analysis revealed that reporting at least two oral problems (OR = 2.7), being dissatisfied with dental appearance (OR = 2.7) and having visited a dentist twice during the previous 3 years (OR = 2.2) were associated with higher odds of reported dental pain. **Conclusion:** A substantial proportion of school children had experience with dental pain. Dental pain associated positively with dental caries, subjective oral health indicators and dental attendance. Knowledge about the extent and significance of dental pain is important for the planning and evaluation of preventive and treatment efforts.

INTRODUCTION

Emerging consensus in the literature has identified three major dimensions of oral health related quality of life (OHRQoL); clinically assessed disease and impairments, disease and treatment specific symptoms and functional and psychological disability (1,2). Over the years, several subjective oral health indicators have been developed for application in adults (3-6). There is a lack of OHRQoL measures designed for children, although paediatric oral disorders are numerous and likely to affect children's quality of life negatively (7,8). Few attempts have been made to assess the prevalence and determinants of OHRQoL generally and dental pain particularly in the child populations of non-industrialized countries. In this study, dental pain is considered to be synonymous with toothache and described as pain originating from innervated tissues within the tooth or immediately adjacent to it (9).

Untreated dental caries might lead to dental pain, which in turn results in impacts of affected play and sleep, avoidance of certain types of food and decreased school performance (9-11). In low-income countries like Uganda, the exposure to dental services is low, and toothache has been cited as a common reason for children to seek dental care (12,13). Previous studies involving 13-19-yr-old Ugandan school children have provided evidence of high rates (44%) of delayed

treatment demand (dental visiting because of toothache), indicating a need for emergency care for later stages of dental caries (12). As a result of a growing consumption of foods and drinks with added sugars and inadequate oral health care services, it is expected that caries experience of children will increase in Uganda and other sub-Saharan African countries (14). Previous national estimates for Uganda have placed the mean DMFT (decayed, missed and filled teeth) for 12-year-olds at 0.5 in 1987, 0.4 in 1988 and 0.4 in 1993 (15). National averages mask differences within the country with mean DMFT estimates varying from 0.6 to 2.9 across urban and rural communities (16).

Most epidemiological studies of the dental health situation in child populations have inquired about dental pain by asking parents (9,17). In the USA, 5% of 5-12-yr-olds reported some pain from their teeth/ gums in the previous 3 months according to their parents (18). Among South Australian children aged 5-15 yr, 12% (5-yr-olds) and 32% (12-yr-olds) reported a history of toothache (19). Shepherd et al. (10) interviewed 8-yr-old British children and found a prevalence of 47.5%. In non-industrialized countries, the prevalence and severity of children's dental pain has usually been higher than the figures presented in UK, the USA and Europe. Ratnayake and Ekanayake (13) examined 8-yr-old Sri Lanka children and found a lifetime prevalence of oral pain of 49% and 53% as reported by

children themselves and their parents, respectively. Naidoo et al. (20) examined 8-10-yr-olds in the Western Cape of South Africa and found a prevalence of dental pain within the past two months as high as 70%. In a recent study of 12-yr-old Ugandan school children from a rural sub-county, toothache in the last four weeks was reported by 36.5%, whereas 20.2% and 6.4% needed a filling and one or more teeth extracted, respectively (15).

According to the biopsychosocial model dental pain is known to have both biological and psychosocial components. Thus, dental pain perceptions are complex functions of socio-demographic status, individual characteristics such as knowledge, beliefs and expectations, in addition to the principle pathological cause of dental caries (5,21). Although found to be consistently associated with severity of tooth decay, conditions such as erosion, trauma and exfoliation of primary teeth can also give rise to dental pain. A review of the epidemiology of dental pain and dental caries in child populations has shown that dental pain is prevalent among children even in contemporary populations with historically low levels of caries experience (9). In the health and lifestyle survey conducted among Finnish adolescents, 1977-1997, no tendency for the prevalence of toothache to decline across time was recorded despite a corresponding decline in caries experience (22). Among 5-10-yr-old South Australian school children, experience of toothache at any time in a child's lifetime was reported by 9% of parents of subjects who had no clinical evidence of dental caries (19). In developed countries, toothache has been reported to be most prevalent in individuals of low income and education (13,17,22). Moreover, the caries-toothache association is found to be strongest in populations with reduced access to dental care, in lower socioeconomic status groups and in populations where dental caries is largely untreated (9). Less frequent dental attendance patterns have been associated with low prevalence of reported dental pain among children in non-industrialized countries (13).

Description of the extent and distribution of dental pain is important when assessing the burden of dental diseases in children. Focusing on 10-14-year-old primary school children in Kampala, Uganda, this study aimed to assess the prevalence of dental pain and its association with dental caries experience, socio-demographic characteristics, oral hygiene, dental attendance and self-reported oral health. Socio-demographics as possible effect modifiers of the association between dental caries and dental pain was also investigated.

MATERIAL AND METHODS

Study population and sampling method

A cross-sectional study was conducted among children attending standard seven in primary schools in Kampala (0.3 mg fluoride/L), the capital city of Uganda.

The study was conducted during January-March 2004 using a structured questionnaire and a clinical examination. A list of all government (public) primary schools ($n = 13$) within the Kampala central division (area 14.7 km²) was obtained from the Division Headquarters. Two primary schools with less than 30 children were excluded due to limited size leaving 11 schools to constitute the sampling frame of 2589 standard seven pupils. A sample size of 650 children was calculated based on an assumed prevalence of reported dental pain of 50%, a standard error of 5% and a design effect of 2 (21). Lists of all students in standard 7 were obtained from the school authorities and every third student in each school was randomly selected to participate. This sampling strategy provided a sample that was self-weighting, implying that each participating student had the same probability of being selected into the study. Allowing for refusal to give informed consent and 701 signed letters were returned. The help of teachers was elicited in reminding the children to return the signed forms and to set an appropriate date for the data collection. A total of 67 pupils were excluded due to a wide age range (15-18 yr) and to being absent from school on the day of data collection. Twenty pupils who completed the questionnaire survey refused to be examined clinically and were also excluded from the study. The final participation rate for the main questionnaire survey and clinical study was 74% ($n = 614$).

Ethical considerations

Ethical clearance was obtained from the ethical research committees in Norway and Uganda. Written permission to conduct the study was obtained from the Ministries of Health and Education in Uganda, local administration authorities and the school authorities. Written informed consent was obtained from the parent on behalf of their children.

Clinical examination

The clinical examination was carried out under field conditions in the class-room setting by one dentist (SNK), whereas a trained assistant recorded the observations. Students were examined whilst seated on a chair, using a head lamp as source of illumination. Initially visible plaque on anterior maxillary teeth was recorded. Dental probes and plane mouth mirrors were employed. The teeth were cleaned and dried with cotton roles before being examined for caries using the decayed, missing and filled tooth index (DMFT) as described by the World Health Organization (23). Caries was recorded as being present when a lesion in a pit/fissure or on a smooth surface had a detectable softened floor, undermined enamel, softened wall or a temporary filling in addition to sticky enamel lesions. A tooth was considered missing if there was a history of extraction due to pain and or the presence of a cavity. Lesions were recorded as present when a carious

cavity was apparent on visual inspection under field conditions (DMFT = 0 and DMFT > 0). Calibration exercise was carried out at the Institute for Pediatric Dentistry, Faculty of Dentistry, University of Bergen, Norway.

Questionnaire survey

The structured questionnaire comprised various socio-demographic and oral health related variables. The questionnaire was constructed and administered in English, which is the language of instruction in all formal academic institutions in Uganda. Health professionals reviewed the survey instrument for semantic, experiential and conceptual equivalence. Sensitivity to culture and selection of appropriate words were considered. The questionnaire was pilot tested and adjusted accordingly before being used in the field. The main researcher (SNK) and four trained assistants administered the questionnaire in schools as part of the classroom activity to provide a standard administration. Questions were read out loud one at a time while the participants filled in the responses on their own.

Dependent variable

Self-reported dental pain was assessed using one single question. The participants were asked whether or not they had experienced dental pain during the previous 12 months. Response categories were given as yes (1) and no (0).

Independent variables

Bleeding gums and sore mouth were inquired in terms of (1) yes and (0) no. *A self-reported oral problem index* was constructed from the two items. Aspects of the dwelling were assessed including fuel used for cooking as indicators of socioeconomic status. The predictor variables used in the analyses, their coding and the number of subjects (%) according to categories are given in Table 1.

Statistical analysis

Data was entered using STAR OFFICE and transferred to SPSS version 13.0 for analyses. Univariate analyses were performed by use of chi-square statistics and logistic regression. Reproducibility was assessed using Cohen's kappa and Spearman's correlation coefficient. Multiple variable analysis was conducted using multiple logistic regression.

RESULTS

Characteristics of participants

A total of 614 students, 45.1% boys, mean age 12.4, SD = 1.0, 59.6% younger (10-12yr) participated in the questionnaire survey and were examined for dental caries. Most of the younger students were girls. A majority confirmed brushing with toothpaste (98%). In Uganda most of the commercialised toothpaste is

fluoridated. Above three in five participants reported at least one oral symptom and 553 (90.1%) were satisfied with their mouth and teeth. A majority, 346 (56.4%) did not confirm dental attendance during the previous 3 years (Table 1).

Test-retest reliability

Forty students (50% boys, mean age 12.6, SD = 1.0) completed the questionnaire and were examined clinically a second time after one week. The examiner agreement for the clinical examination in terms of DMFT was found to be acceptable (Cohen's kappa = 0.75). Spearman's correlation coefficient across the questionnaire variables were 0.38 (toothache), 0.56 (satisfaction with oral condition), 0.53 (satisfaction with dental appearance), 0.84 (dental attendance), 0.74 (household energy source), and 1.00 (age and gender).

Prevalence of caries experience, plaque and self-reported dental pain

The first molars (270 teeth) were most frequently affected with untreated decay, closely followed by the second molars (220 teeth). The lower molars were more frequently affected than their upper counterparts (Figure 1). The mean DMFT was 0.98, SD = 1.6, range 0-15. The prevalence of untreated dental caries, DT>0, was 235 (38.3%), constituting 95% of the DMFT score. The age specific prevalence of caries experience (DMFT>0), visible plaque and self-reported dental pain in boys and girls is depicted in Table 2. Dental pain was confirmed by 284 participants (47.6%, 95% CI 43.7-51.5), 42.1% (95% CI 36.3-47.9) boys and 52.3% (95% CI 48.0-58.0) girls. Among males, 47.9% versus 35.2% (p<0.05) of 10-12-yr-olds and 13-14-yr-olds confirmed dental pain.

Table 1. Number (%) of subjects by category on independent variables.

Variables	Categories (code)	N (%)
<i>Gender</i>	Girl (1)	337 (54.9)
	Boy (2)	277 (45.1)
<i>Age</i>	10-12 (1)	366 (59.6)
	13-14 (2)	248 (40.4)
<i>Household energy source</i>	Electricity (0)	159 (26.0)
	Other (wood/charcoal) (1)	453 (74.0)
<i>Dental visit last three years</i>	Never (1)	346 (56.4)
	Once (2)	163 (26.5)
	Twice (3)	105 (17.1)
<i>Caries experience</i>	DMFT = 0 (0)	367 (59.8)
	0<DMFT<3 (1)	159 (25.9)
	DMFT≥3 (2)	88 (14.3)
<i>Plaque score</i>	No (0)	275 (44.8)
	Yes (1)	339 (55.2)
<i>Dental appearance</i>	Satisfied (0)	509 (83.2)
	Dissatisfied (1)	103 (16.8)
<i>Symptoms</i>	None (0)	200 (34.0)
	One (1)	281 (47.8)
	Two (2)	107 (18.2)

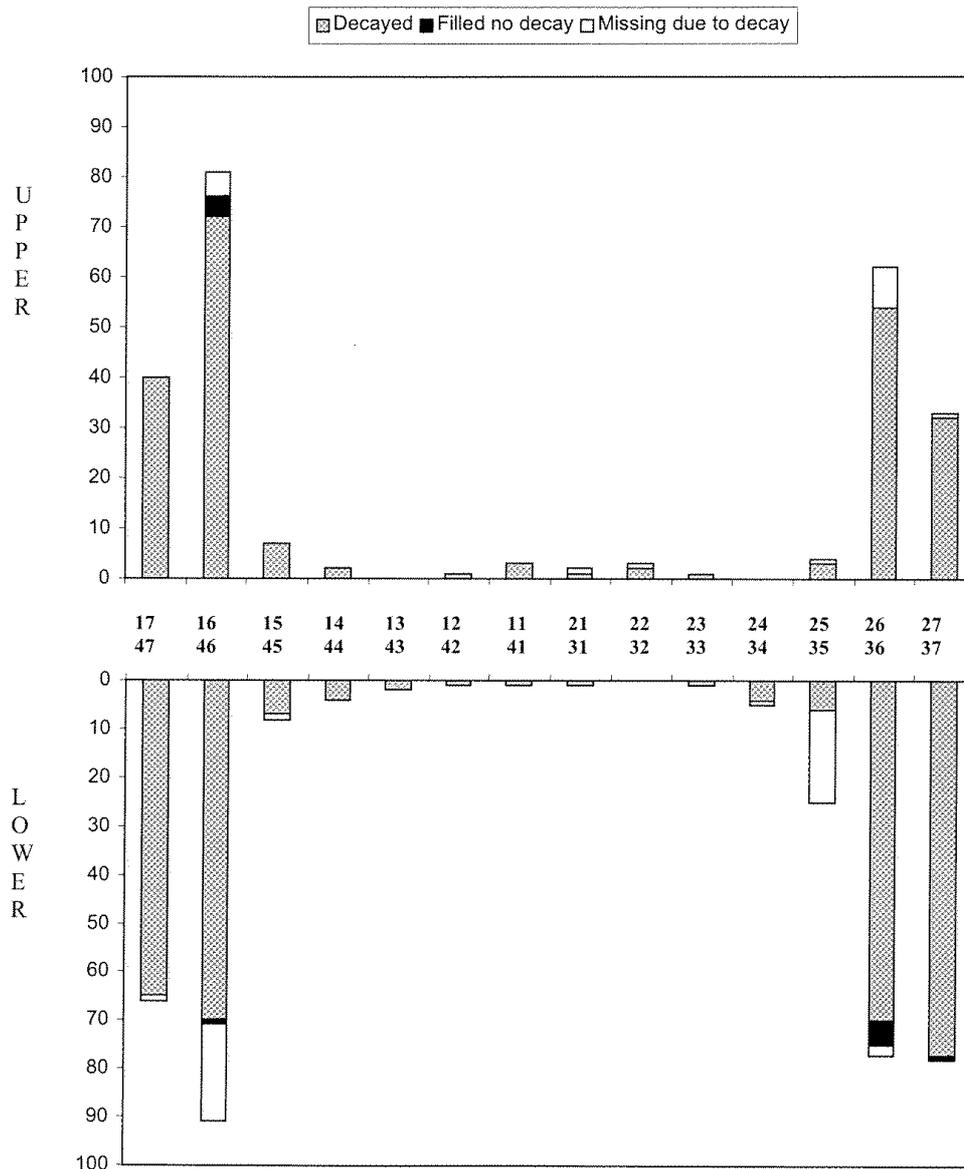


Figure 1. Number of decayed, missed and filled teeth according to tooth type in the upper and lower jaw.

Table 2. Prevalence of reported dental pain, prevalence of caries experience and prevalence of the presence of dental plaque by age and gender.

	Boys			Girls		
	All	10-12	13-14	All	10-12	13-14
DMFT>0	37.9 (105)	33.1 (49)	43.4 (56)*	42.1 (142)	36.7 (80)	52.1 (62)*
Plaque present	60.0 (166)	65.5 (97)	53.5 (69)*	51.3 (173)	54.1 (118)	46.2 (55)
Dental pain-yes	42.1 (112)	47.9 (69)	35.2 (43)*	52.0 (172)	52.3 (112)	51.3 (60)

* p<0.05

Correlates of self-reported dental pain

Caries free children reported experience with dental pain less frequently than their counterparts having DMFT>0 (42.0% versus 55.8%, p<0.001). In children with dental pain experience, 45.4% had DT>0 and

46.1% had never visited a dentist. Table 3 depicts the percentage of participants who reported dental pain by socioeconomic characteristics, oral health related behaviour and self-reported oral health in the total sample and separately for participants with and without dental caries experience. Boys tended to report

Table 3. Percent (n) of participants who reported dental pain by socio-demographics, behavioural and clinical characteristics in the total sample and separately for subjects with and without dental caries experience.

	All % (n)	DMFT > 0	DMFT = 0
<i>Age</i>			
10-12	50.6 (181)	60.3 (76)	45.3 (105)
13-14	43.6 (103)	50.9 (58)	36.0 (45)*
<i>Gender</i>			
Girls	52.0 (172)	60.7 (85)	45.5 (87)
Boys	42.1 (112)*	49.0 (49)*	38.0 (63)
<i>Oral problems</i>			
None	37.5 (75)	47.6 (39)	30.5 (36)
One	47.6 (131)	53.3 (57)	44.0 (74)
Two	63.8 (67)**	72.1 (31)*	58.1 (36)**
<i>Plaque</i>			
no	42.9 (114)	48.9 (43)	39.9 (71)
yes	51.4 (170)*	59.9 (91)	44.1 (79)
<i>Dental appearance</i>			
Satisfied	42.9 (212)	50.8 (99)	37.8 (113)
Dissatisfied	70.3 (71)**	77.3 (34)**	64.9 (37)**
<i>Dental visits</i>			
Never	38.8 (131)	42.7 (47)	36.8 (84)
Once	57.0 (90)	69.9 (51)	45.9 (39)
Twice or more	62.4 (63)**	63.2 (36)**	61.4 (27)*

**p<0.001, *p<0.05

dental pain least frequently – at least those having experience with dental caries. Dental plaque, oral symptoms and children’s global ratings of oral health were statistically significantly associated with dental pain. The prevalence of reported dental pain increased by increasing number of reported dental visits and more strongly among those having DMFT>0 than among their caries-free counterparts.

Table 4 depicts the unadjusted and adjusted odds ratios for having experienced dental pain according to clinical and non-clinical variables. Socio-demographics entered in the first step explained 1.8% of the variance in reported dental pain (Nagelkerke’s R² = 0.018, Model Chi-Square 7.9, df 3, p = 0.047). Entering behavioural variables and self-reported oral health in a second step raised the explained variance to 14.5% (Nagelkerke’s R² = 0.145, Model Chi-Square = 66.3, df 8, p = 0.000). Entering DMFT and plaque scores in the final step raised the explained variance by 1.6 percentage points (Nagelkerke’s R² = 0.016, Model Chi Square = 73.3, df = 10, p = 0.000). In the final model, dental pain was found to be associated with reporting at least two oral problems (OR = 2.7), being dissatisfied with dental appearance (OR = 2.7) and having visited a dentist twice during the previous 3 years (OR = 2.2). Frequency of dental visiting showed a dose-response relationship with reported pain with OR’s of 1.9 and 2.2 for children confirming dental visits once and twice, respectively. A similar pattern was shown for the relationship between dental caries

Table 4. Dental pain regressed upon socio-demographic characteristics, subjective oral health ratings and dental status, unadjusted (unadj) and adjusted (adj) OR and 95% CI.

	OR unadj	95% CI	OR adj	95% CI
<i>Age group</i>				
10-12	1		1	
13-14	0.7	0.5–1.0	0.76	0.5–1.1
<i>Gender</i>				
Girl	1		1	
Boy	0.7	0.4–0.9	0.6	0.5–1.1
<i>Source of cooking</i>				
Electricity/gas	1		1	
Other sources	1.2	0.8–1.6	1.1	0.6–1.6
<i>Oral problems</i>				
None	1		1	
One	1.6	1.1–2.1	1.5	1.1–2.2
Two	2.9	1.8–4.7	2.7	1.6–4.9
<i>Dental appearance</i>				
Satisfied	1		1	
Dissatisfied	3.1	1.9–4.9	2.7	1.5–4.7
<i>Dental visits</i>				
Never	1		1	
Once	2.1	1.4–3.0	1.9	1.3–2.8
Twice	2.6	1.6–4.1	2.2	1.4–3.5
<i>Caries</i>				
DMFT = 0	1		1	
0<DMFT<3	1.7	1.1–2.3	1.4	1.0–2.1
DMFT≥3	1.9	1.2–3.1	1.8	1.1–3.0
<i>Plaque</i>				
No	1		1	
Yes	1.4	1.1–1.9	1.2	0.8–1.7

Nagelkerke’s R² = 15.5

and reported pain with those having 0<DMFT<3 and DMFT≥3 being 1.4 and 1.8 times more likely to report dental pain than their caries free counterparts. The interaction between source of fuel and DMFT status upon dental pain added significantly to the model (p = 0.012). Separate regression models for those having electricity (higher SES group) and those having wood/charcoal (lower SES group) as a source of fuel showed a statistically significant positive relationship between DMFT status and dental pain in the high SES group, only. Age seemed to modify the relationship between dental attendance and dental pain with a positive association being statistically significant among the 10-12-yr-olds only.

DISCUSSION

The results of the present study indicate that the prevalence of dental pain was high (47.6%) among 10-14-yr-old children attending primary school and varied systematically with attitudinal, behavioural and clinical characteristics of the study population. Compared to the European average DMFT score of 2.6 in 12-yr-olds, the present mean DMFT score was low (24). It

accords, however, with previously reported estimates of Ugandan children of comparable ages (16). Moreover, the very high proportion of unrestored teeth assessed (95% of the DMFT score) is consistent with findings from other developing countries (25). It is not possible to assert that the present results demonstrate the crude impact of each explanatory variable considered since they could be biased by background confounding factors. However, the participants might be representative for the child population of 10-14-yr-olds in Kampala since about 90% of children of school-going age (6-14 yr) attend primary schools according to national statistics (26). Because of the realities of life in Uganda, general population surveys of children and adolescents are difficult to conduct, and even the national oral health survey of 12-year-olds was confined to school-going children (27).

Structured self-administered questionnaires as applied in this study have certain limitations (28). Bias due to social desirability, acquiescence and lack of recall are frequently encountered with children (7). Self-reported dental pain is subject to misclassification, because children fail to identify the pain as dental in origin and might include other conditions in their reports (9). Nevertheless, recently developed generic and disease specific oral health related quality of life questionnaires have demonstrated that with appropriate technique it is possible to obtain valid and reliable reports from children (7,8). Age specific questionnaires have been recommended for 6-7, 8-10 and 11-14-yr-olds since those groups are homogeneous in terms of roles and cognitive abilities. A study involving self-completion of dental self-report questionnaires by 6-9-yr-old children showed a high level of concordance between the child and caregiver and appeared to be clinically valid (29). Whereas the reliability coefficients observed in this study indicated moderate reproducibility across questionnaire variables, the positive association found between DMFT status and dental pain supports the validity of children's self-reports. To improve the validity of the single item dental pain measure utilized, further research should include additional questions about more recently experienced dental pain, its perceived causes and impacts.

Comparing the present prevalence rate across child populations should be done with caution due to the various time frames and age groups utilized in different studies. The prevalence estimated in this study accords with the lifetime prevalence (any toothache ever) reported among 5-15 year old Australian school children and that of 8-year-olds from the city of Harrow in England (10,19). It was in accordance with pain experienced during the last four weeks among 8-yr-olds from Sri Lanka (13). However, the prevalence of dental pain among 10-14-yr-old Ugandan school children was higher than that reported in their rural counterparts and also higher than the prevalence found in Brazilian school children of comparable age

(17,15). Despite the various recall periods used, variation in disease patterns and severity might explain the difference observed among rural and urban Ugandan schoolchildren. Okullo et al. (30) observed a higher caries experience among slightly older adolescents in urban Kampala as compared to rural Lira and attributed this regional gradient to the availability of sugared snacks and drinks in towns (31).

Independent of the frequency of dental attendance, the results revealed a positive association between dental caries experience and reported dental pain. Obviously, children's dental pain could be avoided and family quality of life improved through strengthening of the preventive and therapeutic dental services for primary school children (32). The association was moderately strong, however, and only about half of the children with dental pain experience had untreated dental caries. Other possible causes of dental pain in this age group might have been trauma to teeth and eruption of permanent teeth or exfoliation of deciduous teeth. The present finding supports those presented in previous studies suggesting that caries experience is a consistent clinical correlate of dental pain in children (9,13,17). Evidence suggest that low family income and educational level associate with increased dental pain in children after controlling for confounding factors (22). Incidentally, the lack of a social gradient as observed here might be unique to the participants investigated, confirming the social homogeneity of Kampala city children attending primary school. Children's socioeconomic status occurred as a significant modifier of the association between caries experience and reported dental pain with the strongest relationship found in children from higher socioeconomic status families. Previous studies of sub-Saharan African origin have identified a social gradient in dental caries experience with children from upper social classes being those most seriously affected (14). In contrast, contemporary evidence from industrialised countries have shown that the lower the material standard of living, the worse the oral health whatever measure are used to assess this, be they clinical or self-reported indicators (9). Moreover, it is noteworthy that children who had seen a dentist once or twice during the previous 3 years reported dental pain more often than their counterparts with no dental visits. Similar results have been reported previously and might be attributed to symptomatic dental attendance patterns and need for emergency care in later stages of dental caries rather than an unexpected response to dental treatment (12,33).

In sum, the present study indicates that the prevalence of reported dental pain was high in 10-14-yr-old children attending primary school in Kampala. Although the average DMFT was low, untreated caries contributed 95% of children's caries experience. Dental pain was most frequent in children having untreated dental caries, being dissatisfied with their oral health and among those who had attended a dentist most

frequently. The caries–dental pain relationship was stronger in children from higher socioeconomic backgrounds. Knowledge about the extent and significance of reported dental pain clearly indicates a need to strengthening preventive and therapeutic dental services among primary school children in Kampala.

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