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ORIGINAL ARTICLE

Caretaker's caries experience and its association with early childhood caries and children's oral health-related quality of life: A prospective two-generation study

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ABSTRACT

Objectives: The first objective of this study is to examine the association between caretakers' caries experience and caries experience of their children. Second, to investigate whether children's and caretaker's caries experience is associated with oral health-related quality of life (OHRQoL) of children and their families.

Methods: This study is based on the prenatal recruitment interviews and the 5-year follow-up of 417 caretaker–children pairs from the Ugandan site of the PROMISE-EBF trial conducted in Mbale, Eastern Uganda. Face-to-face interviews were conducted with caretakers at the household level. Caries experience of caretakers (DMFT >0) and children (dmft >0) were assessed in accordance with the criteria of the World Health Organization. OHRQoL was assessed using an abbreviated version of the Early Childhood Oral Health Impact Scale (ECOHIS).

Results: Adjusted negative binomial regression analysis revealed that caretaker's caries experience was positively associated with early childhood caries of their offspring (IRR 2.0, 95% confidence interval (CI) 1.3–3.0). Children's caries experience (IRR 1.8, 95% CI 1.2–3.0), but not caries experience of caretakers, was associated with worse OHRQoL of children and their families. Caretakers who perceived good child oral health were less likely to report OHRQoL impacts (IRR 0.20, 95% CI 0.12–0.35).

Conclusion: Improving caretaker's caries experience and her perception of child's oral health status could improve children's caries experience and the OHRQoL of children and family. Such knowledge is important and should inform public oral health programs for young children.

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Introduction

Early childhood caries (ECC) represents one of the most common chronic diseases in infants and toddlers globally.[1] According to the Global Burden of Diseases 2010 study, untreated caries in deciduous teeth ranks as the 10th most prevalent condition affecting 9% of the children worldwide.[2] A recent epidemiological study from Australia, UK and US [3] suggests that ECC affects up to 50% of 3–6 year old children. Corresponding figures in low-income countries vary from 6% to 71% [4,5] with prevalence reported to be as high as 85%.[6]

Evidence suggests that a nexus of factors influence the development of ECC.[7] Fisher Owen's conceptual model describes attributes that impact on child's oral health status at the child-, family- and community level.[8] According to the total environment assessment model of early childhood development (Team – ECD), parental practices are recognized as the primary source of children's experience.[9] Influence of parental characteristics on their children's oral health might be considered from a life course perspective suggesting that exposure to adverse environments at early- and later life course stages contributes additively to caries and periodontal health.[10,11] Features of the family environment are parental socio-demographic factors, child's feeding- and raring practices, parents' own oral health behaviours, parental oral condition, perceptions as well as their psychological characteristics, such as depression and anxiety.[3,11,12] Previous studies have reported associations of caretakers' characteristics with children's risk of dental caries.[3,11,13–15] In terms of Bandura's social cognitive theory,[16] socialization to oral health is considered a modelling process whereby children imitate their parents and consider them as valued role models. Parental modelling has proved to be a powerful mean of establishing children's tooth brushing behaviour.[17] Studies have also reported on positive correlations among parent's caries experience, tooth loss and oral hygiene and their children's caries experience.[3,11,13,14,18,19]

ECC impacts on the quality of life in children themselves and the family to an extent similar to other systemic diseases and interferes adversely with nutritional status, self-esteem and learning abilities.[20–23] The concept of oral health

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related quality of life (OHRQoL) relates to the impact of oral diseases on individual's daily functioning, recognizing the interaction between individual health condition and environmental influences.[24] One of the very few instruments developed to assess OHRQoL in preschool children (2–5 years) is the Early Childhood Oral Health Impact Scale (ECOHIS) inventory.[25] This instrument, originally developed in English, has been translated and adapted for use in other languages and consists of a child- and a family impact scale with 9 and 4 items, respectively. It is administered by caretakers on behalf of their child. A culturally adapted and shortened version of the ECOHIS scale has demonstrated satisfactory psychometric properties among children and their parents in East African countries, including Uganda [22].

Although caretaker's characteristics are recognized to be important in the development of children's caries experience and thus their OHRQoL, these relationships are still less well understood, particularly in low-income countries. In a recent systematic global review of 55 studies considering parental covariates of ECC, only three studies emanated from Africa, seven had a longitudinal design and nine included clinical measures of parental oral health status.[3] Most studies have taken place in high-income countries where cultural norms about child rearing and the oral health care delivering system differ from that in most sub-Sahara African countries. Previous studies from the research project presented in this paper have investigated any protective effect on ECC of mother's participation in a breastfeeding promotion program.[26] Caregiver's oral health status and its relationship with their children's caries experience and its socio-psychological consequences have not yet been investigated.

The first objective of this study was to examine whether caretakers' caries experience was associated with ECC of their 5-year-old children in households in Mbale, Eastern Uganda. A second aim was to investigate whether children's and caretaker's caries experience was associated with OHRQoL of children and their families after adjusting for possible confounding factors related to socio-demographics and parental attributes. It was hypothesized that children's ECC associated positively with the caries experience of their caretakers. Also, it was hypothesized that children's and caretaker's caries experience would affect the OHRQoL of 5-year-old children and their families.

Method

This study is based on the 5-year-follow-up of caretaker–children pairs from the Ugandan site of the PROMISE-EBF trial (ClinicalTrials.gov no: NCT00397150) conducted in 2011 in Mbale district, Eastern Uganda.[27] Mbale has a literacy rate of 75% and 60% among males and females, respectively. PROMISE-EBF was a multicenter community based cluster-randomized behavioural intervention trial conducted in sub-Saharan Africa that aimed to assess the effect of individual home-based peer counselling on exclusive breastfeeding for 24 weeks after birth. Detailed information about the PROMISE-EBF trial has been published previously.[26,27] A total of 863 mothers were recruited at 7 months of gestational age into the Ugandan site of the PROMISE-EBF trial and 765 healthy mother–infant pairs were included in the analyses. Follow-ups were carried out at household level at 3 weeks-, 6 weeks-, 12 weeks-, 24 weeks, 2-years and 5-years postnatal between 2006 and 2011. A total of 417 caregivers/child pairs participated both at baseline and at the 5-year follow-up. In the present paper, data came from two sources; caretakers and their 5-year-old children. Permission to conduct the study was given by Makerere University School of Medicine, Research and Ethics Committee (SOMREC), the Uganda National Council for Science and Technology and Regional Committees for Medical and Health Research Ethics, Western Norway (05/8197). Informed consent was given at the individual level.

Interviews with caregivers at baseline recruitment and 5-year follow-up

Trained research assistants conducted interviews in the local language Lumasaba. The interview schedule applied was constructed in English and translated into Lumasaba for use in the field. Project staff reviewed the interview schedule for semantic, experiential and conceptual equivalence to the source version. Sensitivity to culture and selection of appropriate words were considered. The caretakers responded to questions about themselves and their children. Interviews were performed face-to-face with primary caretakers both at baseline and 5-year follow-up. At the 5-year follow up, interviews were performed with caretakers before their children underwent oral clinical examination. Caretaker's socio-demographic characteristics: a socio-economic asset index categorized into wealth quintiles and based on ownership of household assets, such as furniture, electricity, type of water source, roof material and type of toilet was constructed at the baseline recruitment interview (at 7 months gestational age). This socio-economic asset index was initially categorized into quintiles ranging 1–5 (most poor–least poor) and then recoded for analysis into 1 = least poor (including quintiles 1–3) and 0 = most poor (including quintiles 4–5). Other socio-demographics assessed at the recruitment interview were, sex, caregivers education, marital status and number of children before indexed child (Table 1). Caretaker's use of toothpaste was assessed; yes = 1, no = 0. Caretaker's perceived oral health status was evaluated on Likert scale ranging from 1 = very poor to 5 = very good and dichotomized for analysis into 1 = good (including original categories 1–3) and 2 = bad (including the original categories 4–5). Child's oral health as perceived by caretaker was measured by asking "In general how would you describe the oral health condition of your child?" Responses were given in a Likert scale ranging from 1 = very poor to 5 = very good. It was dichotomized for analysis in to 1 = good (including the original categories 1–3) and bad (including the original categories 4–5). At the 5-year follow up, child's sugary drinks consumption was measured by asking caretakers how often the child drank fruit juice and sweetened beverages. Responses were give as 0 = no, never, 1 = yes, less than weekly, 2 = 1-3 times/week, 3 = 4-6 times/week, 4 = daily and 9 = don't know.

Table 1. Frequency distribution of socio-demographics, clinical and non-clinical characteristics of children and caretakers ($n = 417$).

Variable	Categories	% (*n*)
Child's variables		
Sex of child	Male	49.9 (208)
	Female	50.1 (209)
ECC (dmft >0)	No	60.7 (253)
	Yes	39.3 (164)
Self-reported oral health status perceived by caretakers	Bad	17.0 (70)
	Good	83.0 (343)
Tooth brushing frequency	Never	41.1 (169)
	At least once a week	58.9 (242)
Sugary drinks consumption	Never	17.6 (73)
	At least once a week	82.4 (341)
Caretaker's variables		
Sex	Male	3.1 (13)
	Female	96.9 (402)
Education level	<=6 years	54.9 (229)
	>7 years	45.1 (188)
Marital status	Married/cohabiting	94.0 (390)
	Single	6.0 (25)
Number of children before index child	2 or less	48.7 (201)
	More than 2	51.3 (212)
Wealth quintile	poor	64.7 (270)
	Least poor	35.3 (147)
Age	≤30 years	56.6 (207)
	>30years	43.4 (159)
Dental caries (DMFT >0)	No	36.7 (153)
	Yes	63.3 (264)
Self-reported oral health status	Bad	46.5 (192)
	good	53.5 (221)
Use of tooth paste	No	23.0 (94)
	Yes	77.0 (315)

For the analysis, a new variable was then constructed that recoded responses: 0 = never, 1 = at least once a week (including the original categories 1–4). The "I don't know" category was coded as missing. The child's tooth brushing frequency was measured by asking caretakers how often the child's teeth are cleaned/brushed. Responses were never = 0, less than once a day = 1, once a day = 2, twice a day = 3, more than twice a day = 4. For the analysis, a new variable was constructed that recoded responses 0–1 to never and 2–4 to at least once a day.

At the 5-year follow-up, a slightly modified and abbreviated ECOHIS interview schedule, previously assessed for its psychometric properties among preschool children in Uganda [22], was administered in the field by locally recruited and trained research assistants. The ECOHIS is a proxy measure of children's OHRQoL with parents/caretakers as the secondary respondents since young children lack cognitive skills necessary to evaluate their own quality of life. The Child Impact Section, CIS, was assessed using five of its original nine questions, covering the original four subdomains; symptoms, function, psychology, self-image and child social interaction. Responses were given as 0 = no 1 = yes, 2 = I do not know. Dummy variables (0 = no, 1 = yes) were summarized (range 0–5) into a count variable and then dichotomized into 0 = "no child impacts" and 1 = "at least one child impact" after recoding all "don't know" categories to missing. Family Impact Section, FIS, was assessed using the original four questions covering two domains of family distress and family function. "How often have you or the other parent- because of child's dental problems; taken time off from work, been upset, felt guilty and had financial problems?" Response categories were rated on a 5-point Likert scale; 0 = never to 5 = almost daily. Each item was dichotomized into 0 = never/hardly never and 1 = experienced family impact occasionally, often or very often. Dummy variables were summarized (range 0–4) into a count variable and then dichotomized into 0 = no family impacts and 1 = at least one family impact. Total OHRQoL scores were constructed by adding the Child and Family impact scores. A dichotomy variable in terms of 0 = no total OHRQoL impact and 1 = at least one OHRQoL impact was constructed for analyses.

Oral clinical examination with caretakers and child at 5-year follow-up

Full mouth clinical examinations of caretakers and children were carried out by two experienced, trained and calibrated dentists (A.K. and N.B.). Both dentists were blinded to the allocation status of the participants in the PROMISE-EBF trial. Clinical data were collected on fully erupted teeth according to the World Health Organization, WHO, recommendations for field surveys.[28] A tooth was scored as decayed once there was visible cavitation and or cavitation on probing using a dental probe, a dental mirror and natural light. Caries experience of caretakers and their children were recorded at tooth level, using the decayed missing and filled teeth index (DMFT and dmft). For the analysis, dental caries was denoted in two ways: the presence or absence of dmft/DMFT and the total count of the number of decayed missing or filled teeth in the caretakers and children. In the present analyses, dmft/DMFT scored 0 and 1 for the absence and present of caries experience.

Statistical analysis

Data were analyzed using the statistical software Stata IC version 13 (StataCorp, College Station, TX). Internal consistency reliability was examined using Cronbach's alpha for the CIS, FIS and combined sections of the modified ECOHIS. Test-retest analysis was performed using Cohen's kappa statistics. Bivariate analyses were conducted with cross-tabulations and Chi-square statistics and with unadjusted negative binomial regression analyses. The outcome variables, ECC and total OHRQoL were analyzed as count variables. Since they had a skewed distribution with dispersion of mean from variance, negative binomial regression was used for multiple variable analyses. All socio-demographics, self-reported and clinical oral health variables that were statistically significantly associated with oral health outcomes in the bivariate analyses were entered into the multiple negative binomial regression models. Thus, the effect measures were reported in terms of incidence rate ratios (IRRs) with the 95% confidence intervals (CI). Variables whose univariate tests showed a p-value <0.05 were included as covariates in the multivariable negative binomial regression analyses. To adjust for potential differences in loss-to-follow-up, an inverse-probability weighted method was applied using probit regression for binary outcomes to predict risk of lost-to-follow-up based on

Table 2. Frequency distribution and Cronbach's alpha of child impact-, family impact- and total scores by sex.

Items		Total % (*n*)	Boys % (*n*)	Girls % (*n*)
Child impact				
Has child				
Ever had a toothache		17.9 (74)	19.5 (40)	16.4 (34)
Ever had swollen/bleeding gums		12.1 (50)	12.7 (26)	11.6 (24)
Ever cried because of pain in the mouth		14.6 (60)	14.2 (29)	15.0 (31)
Ever failed to sleep because of pain in the mouth		8.5 (35)	8.9 (18)	8.2 (17)
Ever refused to eat because of pain in the mouth		10.5 (43)	9.4 (19)	11.6 (24)
Ever refused to play because of pain the mouth		7.8 (32)	8.9 (18)	6.8 (14)
Family impact				
How often have you or another family member because of problems with child's teeth and mouth				
Taken time off work		8.5 (35)	7.8 (16)	9.2 (19)
Been upset		6.1 (25)	4.9 (10)	7.3 (15)
Felt guilty		4.6 (19)	3.9 (8)	5.3 (11)
Had financial loss/difficulties		3.2 (13)	2.5 (5)	3.9 (8)
	Cronbach's alpha			
Total child impact score	0.91	23.5 (97)	25.4 (52)	21.7(45)
Total family impact score	0.89	8.7 (36)	8.3 (17)	9.2 (19)
OHRQoL (child and family impact)	0.92	24.2 (100)	25.8 (53)	22.7 (47)

background factors associated with lost to follow-up (socio-economic status, level of education and residence in rural/urban area). The median and interquartile range (IQR) of the weights was 1.8 (IQR 1.7–2.0). In the analysis, adjustment for cluster effects was performed due to the cluster design.

Results

The results of the calibration process, comparing the dmft scores for each tooth between two examiners revealed an observed median kappa value for inter-rater agreement amounting to 0.92 with an interquartile range (IQR) of 0.62–1. The median and IQR kappa values for intra-rater agreement was of 0.80 (0.64–1). The corresponding values for DMFT scores of the caregivers were 0.91 (0.67–1) and 0.83 (0.77–1), respectively.

Table 1 shows the categories and frequency distribution of socio-demographics- and clinical-variables of caretakers and children. Most of the responding caregivers, 97.0%, were females. Their mean age (SD) was 31.1 (7.8) years. The mean age (SD) of the children was 4.5 (0.6) years and the frequency sex distribution was almost equal with 209 (50.1%) females and 208 (49.9%) males. More than half of the caretakers had attained primary level education with 55.0% having at least 7 years of education. Majority of caretakers were married or cohabiting (94.0%). A substantial proportion of the caretakers had experienced dental caries with a prevalence of 63% and mean DMFT of 2.5 (3.5). The corresponding figures for children's ECC were 39.0% and 1.6 (2.9), respectively. About one-half of the caretakers perceived their own oral health (53.4%) as good whereas about 83.0% perceived the oral health status of their child as good. The use of toothpaste was confirmed by 77.0% of caretakers. Child's sugary drink consumption and tooth brushing with a frequency at least once a week were reported by 82.4% and 58.9%, respectively.

Table 2 depicts the distribution of responses to the abbreviated ECOHIS inventory according to each question and separately for boys and girls. As shown, the prevalence of child- and family impacts amounted to 23.5% and 8.7%, respectively. The corresponding figure for the total OHRQoL score was 24.2%. Child impacts ranged from 7.8% (child refusing to play) to 17.9% (child having toothache) and were more frequently reported for boys than for girls. The prevalence of family impacts ranged from 8.5% (time off from work) to 3.2% (had financial costs) and were most frequently reported for girls. The internal consistency reliability of the child-, family- and total OHRQoL impact scores in terms of Cronbach's alpha were, respectively, 0.91, 0.89 and 0.92.

Children's caries experience associated positively with the total child impact scores and with all single child impact scores (data not shown). Children's caries experience did not discriminate significantly between groups with and without family impacts although the prevalence of impacts was higher in children with (11.7%) than without caries experience (6.8%). Having caries was associated with being upset because of problems with child's mouth and teeth (9.3% versus 4.0%, $p < 0.05$). Caretaker's caries status associated positively with the total child impact score in that 27.0% of caretakers with DMFT >0 and 18.0% of caretakers with DMFT $=0$ reported child impacts. Total OHRQoL score associated positively with child's dmft as well as with caretaker's DMFT status (data not shown).

In this cohort, caretakers with and without dental caries experience did not differ in terms of socio-demographic characteristics assessed at the 7th month of gestational age recruitment interview (data not shown). As shown in Table 3, and according to unadjusted negative binomial regression analysis, children with and without caries experience did not differ significantly with respect to socio-demographic factors, except for caretaker's marital status. Children with married or cohabiting caretakers were less likely than children with single caretakers to present with dmft >0 (IRR: 0.4, 95% CI 0.2–0.9). Children with caretakers having DMFT >0 were twice as likely as their counterparts with caries free caretakers to present with dmft >0 (IRR: 2.0, 95% CI 1.4–3.0). The prevalence of total OHRQoL impacts was significantly higher when caretaker (IRR 1.4, 95% CI 0.9–2.3) and child (IRR 2.1, 95% CI 1.4–3.3) presented with caries experience. Caretakers, who perceived their own oral health status (IRR 0.5, 95% CI

Table 3. Frequency distribution of ECC and total OHRQoL scores by caretakers and children's socio-demographic, behavioural and oral health related factors.

Variables	ECC> 0 % (*n*)	ECC >0 IRR (95% CI)	Total OHRQoL >0 % (*n*)	Total OHRQoL >0 IRR (95% CI)
Characteristics of caretaker				
Social economic status				
1st, 2nd & 3rd wealth quintiles (poor)	37.3 (101)	1	23.1 (62)	1
4th & 5th wealth quintiles (least poor)	42.9 (63)	1.2 (0.8–1.5)	26.4 (38)	0.9 (0.6–1.4)
Marital status				
Single	32.0 (8)	1	20.8 (5)	1
Married	39.7 (155)	0.4 (0.2–0.9)	24.2 (94)	1.2 (0.5–2.9)
Number of children before indexed child				
2 or less	36.8 (72)	1	20.7 (41)	1
More than 2	41.0 (87)	0.9 (0.7–1.3)	26.7 (56)	1.5 (1.1–2.3)
Age				
≤30	39.1 (81)	1	24.5 (50)	1
>30	37.1 (59)	0.9 (0.7–1.3)	24.7 (39)	1.3 (0.9–1.9)
Years of education level				
≤6 years	40 (92)	1	23.4 (53)	1
≥7years	38.3 (72)	1.0 (0.8–1.3)	25.3 (47)	0.9 (0.6–1.5)
Use of tooth paste				
no	30.9 (29)	1	26.6 (25)	1
yes	42.2(133)*	1.3 (0.8–2.0)	23.2 (73)	0.6 (0.4–1.2)
Caretaker's perceived oral health				
bad	38.5 (74)	1	29.7 (57)*	1
good	40.3 (89)	0.7 (0.5–1.1)	19.5 (43)	0.5 (0.3–0.8)
Dental caries(DMFT >0)				
no	30.7 (47)	1	18.5 (28)	1
yes	44.2 (11)**	2.0 (1.4–3.0)	27.5 (72)*	1.4 (0.9–2.3)
Child's characteristics				
Child ECC (dmft >0)				
No	–	–	16.8 (42)	1
Yes			35.6 (58)**	2.1 (1.4–3.3)
Perceived oral health status by caretaker				
bad	51.4 (36)*	1	52.9 (37)	1
good	37 (127)	0.7 (0.5–1.1)	18.4 (63)**	0.2 (0.2–0.3)
Sugary drink consumption				
Never	32.9 (24)	1	27.4 (14)	1
At least once a week	41.1 (140)	1.3 (0.8–2.3)	23.5(80)	0.6 (0.4–1.0)
Tooth brushing				
Never	36.1 (61)	1	25.4 (43)	1
At least once a week	42.2 (102)	1.1 (0.7–1.6)	23.6 (57)	0.9 (0.5–1.3)

*$p < 0.05$, **$p < 0.001$.

Table 4. Negative binomial regression of child's dmft by caretaker's DMFT, mother's age and marital status.

variable	Category	IRR (95% CI)
Caretaker's DMFT	no	1
	yes	2.0 (1.3–3.0)
Caretaker's age	≤30	1
	>30	0.91 (0.65–1.3)
Marital status	Married	
	Single	2.0 (0.91–4.2)

0.3–0.8) as well as the oral health status of their child (IRR 0.2, 95% CI 0.2–0.3) to be good, reported better OHRQoL status of child and family.

In the final multivariate negative binomial models, regressing dmft on DMFT and adjusting for covariates revealed that caretakers' DMFT, but not marital status maintained statistical significant relationships with children's caries experience. Compared with children of caretakers with DMFT = 0, children of caretakers with DMFT >0 were more likely to present with caries experience, dmft >0 (IRR 1.9, 95% CI 1.2–2.9) (Table 4). Regressing total OHRQoL impacts on caretaker's DMFT, children's dmft, caretaker's perception of own oral health status and caretaker's perception of child's oral health status, revealed that caretaker's whose children had dmft >0 and who themselves perceived child oral health to be good were more and less likely to report OHRQoL impacts, respectively. The corresponding IRRs were 1.8 (95% CI 1.2–3.0) and 0.20 (95% CI 0.1–0.3) (Table 5).

Discussion

This study provides evidence of ECC and its association with caretaker's caries experience and the OHRQoL of children and their families in a low-income country context. Using a longitudinal design with a community-based sample and adjusting for potential confounding factors, this study is the first to show that Ugandan caretakers with caries experience (DMFT >0) were more likely to have 5-year-old children with experience of ECC. Also, caretakers having 5-year-old children with ECC (dmft >0) and those who perceived good oral health on part of their child were, respectively, more and less likely than their counterparts to report OHRQoL impairments in children and the family.

Some limitations should be considered when interpreting the findings of this study. Caries both in caretakers and in children was recorded at the cavity level in household settings without having access to X-rays and with daylight as the only source of illumination. These procedures may have increased, on one hand, the risk of underestimating the

Table 5. Total OHRQoL scores regressed on caretaker's DMFT, age, perceived own oral health, dmft and perceived child oral status.

Variable	Category	Adjusted negative binomial regression, IRR (95% CI)
Caretaker's DMFT	No	1
	Yes	1.5 (0.79–2.9)
Age of caretaker	≤30	1
	<30	1.0 (0.64–1.6)
Caretaker's perceived own oral status	Bad	1
	Good	0.77 (0.42–1.4)
Child's dmft	No	1
	Yes	1.8 (1.2–3.0)
Caretaker's perceived child oral status	Bad	1
	Good	0.20 (0.12-0.35)

actual caries prevalence by excluding white spot lesions, an important indicator of ECC, thus enhancing the possibility of making type 2 errors. On the other hand, the risk of misclassifying white spot caries- and developmental defects such as hypoplasia might have been avoided. The fact that information about caretaker's caries experience stems from mothers mostly implies that corresponding information from fathers was lacking which might constitute yet another limitation.[29] However, previous research has suggested that the mother–child correlation is higher than the father–child correlation in terms decayed, missed and filled teeth indices.[30] In accordance with most previous studies, the present one assessed child- and family impacts according to the perceptions of caretakers, considering the cognitive and linguistic issue of the early childhood period.[25,31] It has been questioned, however, whether parental proxy reports are identical with those of their young children, acknowledging that 4–6 year olds are able to give reliable reports regarding their OHRQoL.[30,32] A recent study from Brazil observed differences in mean OHRQoL scores between parent–child pairs concluding that both child- and parental proxy reports should be included when measuring impact on children's OHRQoL.[29] Notably, the child impact scores utilized in this study deviated from the original English version in being shortened by four items, not considered to be appropriate in the Ugandan socio-cultural context.[22] Since only five of the original nine child impact scores were retained, the feasibility of the present scores in cross-national comparisons might be somehow restricted. Nevertheless, in accordance with a previous study among Ugandan children, and also corroborating findings from other socio-cultural contexts,[22,33] the internal consistency reliability of the sub-scale- and total OHRQoL scores were above the threshold value of 0.70, above which scores are deemed to be excellent.[34] Strengths of the present study were its prospective inter-generational design as well as the inclusion of both clinical- and self-reported measures of caretaker's and children's oral health status. Also, this study presented quite a high participation rate for 5 years considering that caretakers were asked to complete several long interviews.

The study sample consisted of participants who were consecutively selected from clusters of villages. The clusters included in the PROMISE-EBF trial were selected based on information provided on social services and infrastructure characteristics. Therefore, there were implications on the external validity as well as the precision of the study estimates since clusters were the primary sampling units. None the less the possibility for misleading inferences was dealt with by adjusting for the clustering in the analysis [35]. Due to the heterogeneity in the Ugandan population, the results are generalizable to the local study area of Mbale, but cannot be considered to cover the whole country of Uganda. Caretaker's caries experience was positively and substantially associated with children's caries experience in both unadjusted and adjusted negative binomial regression models. This finding highlights the importance of early life stage family influences on ECC development as suggested by Fisher Owens' conceptual model.[8] These results are in accordance with previous studies where parental active caries, higher rates of Streptococcus Mutans and edentulism have correlated positively with child's ECC.[3,11,36] Several plausible explanations for these relationships have been suggested, such as the mother–child transmission of genetic factors, immunologic responses to cariogenic bacteria, salivary characteristics, as well as impact on birthweight and later caries susceptibility from impaired maternal nutrition during pregnancy.[37] Dental anxiety of the mother has been discussed as a possible mechanism through which the mother's oral health status is linked to that of their child offspring.[38] Alternatively, nutritional habits and taste as well as oral hygiene are caries predictors shared by all family members. Thus, children's intake of snacks and their oral hygiene habits have been found to be positively correlated with those of their mothers.[30] Socioeconomic status and sugar snacking have been recognized as risk indicators of children's caries experience in many developed countries.[39] It is unclear why this study failed to establish significant associations between ECC and child's intake of sugary drinks as well as the family wealth index scores. Few caretakers reported child's never using sugary drinks which may explain absence of a significant association. Nevertheless, similar null associations have been reported previously.[3] In accordance with previous literature, caretakers who were married/cohabiting and probably better-off were more likely to have children without ECC, thus highlighting the importance of parental social attributes.[3]

In accordance with previous East African studies, children's caries experience was significantly and positively associated with the child- and total OHRQoL impact scores, but not with the family impact scores.[22] As in the present study, a positive association was reported between ECC and the total ECOHIS scores of Brazilian- and Chinese preschool children.[23,40] Since caretaker's caries experience was related to child's ECC and ECC was related to OHRQoL in unadjusted analyses, it was reasonable to suggest a relationship also between caretaker's caries experience and OHRQoL in children and their families. A positive relationship between caretaker's DMFT and OHRQoL was observed in the adjusted negative binomial regression analysis – but this relationship was not statistically significant. Nevertheless, OHRQoL impacts associated in the expected direction with parental perception of child's oral health situation as good or bad. This appears to imply that caretakers who perceived child's

oral health as poor were more likely than their counterparts to report impacts on functional and psychosocial quality of life aspects of children and their family. The present findings indicating positive relationships between clinical and self-reported measures of children's oral health add support to the discriminative validity of the abbreviated Lumasaba version of ECOHIS utilized in this study. In addition, the fact that caretakers completed all items of the child- and family impact interview adds support to its face validity.

In conclusion, improving caretaker's caries experience and her perception of child's oral health status could improve children's caries experience and the OHRQoL of children and family. Such knowledge is important and should inform public oral health programs for young children.

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