Prevalence of dental caries and oral health related quality of life among preschool children aged 4-6 years in Kisarawe, Tanzania.

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Dental caries, oral health related quality of life, pre-school children.
Abstract

Background Preschool years are a critical period in the development of a healthy child. The consequences of poor oral health in preschool children reach beyond dental problems, with oral health-related quality of life (OHRQoL) being associated with overall systematic health as well as one’s quality of life. The purpose of this study was to explore the level to which dental caries impacts the OHRQoL in a sample of preschooler children in Kisarawe.

Methods A cross-sectional based study was conducted in 2017. A total of 1,106 preschool children completed a face-to-face interview, using a translated Kiswahili version of the Michigan Oral Health-related Quality of Life Scale-Child Version (2003), and underwent clinical oral examination using WHO (1997) criteria.

Results The decayed component was the most prevalent (dft = 2.08) and the Significant Caries Index (SiC) was 5.54 double of the (dft), showing polarization of dental caries in the studied population. After adjusting for appropriate covariates, preschool children of age 5 and 6 years old were more likely to have decayed tooth [Adjusted OR = 3.02, (95% CI =2.01-4.54)] and [Adjusted OR=2.23, (95% CI= 1.55-3.20)] respectively. Preschool children without visible plaque on the buccal surface of upper anterior teeth were less likely to have decayed teeth [Adjusted OR=0.21, (95% CI=0.09-0.45)]. Regarding measurements of oral health-related quality of life using the MOHRQoL, only preschool children who reported on ‘does your teeth hurt you now?’ and ‘do kids make fun of your teeth?’ were more likely to have a decayed tooth [Adjusted OR=1.74, (95% CI=1.12-2.71)] and [Adjusted OR=1.87, (95% CI=1.11-3.15)], respectfully.

Conclusion The findings suggest that dental caries, affecting a significant portion of preschoolers, was associated with both poor oral hygiene and the age of the child. The MOHRQoL
appear to be able to discriminate between groups, and preschool children of 4-6 years of age are reliable informants to answer the MOHRQoL in this group of Tanzanian children.

Background

Despite the decline in the prevalence of dental caries in children in western countries, caries in preschool children remains a major problem in both developed and developing countries\(^1\). Dental caries is a common infectious disease, where acid-producing bacteria, known as *Mutans Streptococci*, live in the tissues of the mouth and metabolize sugars. The acid, produced over time, demineralizes the tooth structure and causes caries\(^1, 2\). Sugary food and beverage consumption have a major impact on an individual’s experience of caries, both in childhood and in adulthood. High sugar intakes increase the amount of *Mutans Streptococci* in the mouth, which in turn increases the chance of destruction of teeth\(^1, 2\). Previous research has identified a range of risk factors for developing dental caries to preschool children that involves a complex interaction of biological, social and economic factors, not dissimilar to factors that increase the susceptibility of developing caries at later life stages\(^1, 2, 3\).

Preschool years are a critical period in the development of a healthy child\(^1, 3, 4\). In many developing countries, over 90% of dental caries in preschool children has remained untreated\(^1, 2, 3\). The consequences of poor oral health to preschool children reach beyond dental problems, with oral health being associated with overall systematic health as well as one’s quality of life\(^5\). In 1992, Acs and colleagues conducted a study of three-year-old children and reported that preschool
on average children with decayed teeth weighed one kilogram less than children without decayed teeth\(^6\). In another study, Ayhan and colleagues in 1996 reported a similar finding that among Turkish preschool children between ages 3 to 5 years, children with decayed teeth were significantly lighter and shorter than preschool children without caries\(^7\). The oral health status of preschoolers relies heavily on the caregivers; therefore, understanding what parents and teachers know about oral health is crucial when working towards modifying behaviors and encouraging health promotion\(^1, \ 2, \ 8\).

Untreated caries significantly impacts on the quality of life of preschool children and their dietary intake\(^1, \ 33\). OHRQoL is a multidimensional construct that includes a subjective evaluation of the individual’s oral health, functional well-being, emotional wellbeing, expectations and satisfaction with care, and sense of self\(^34, \ 36\). OHRQoL concept fulfills the framework of patient assessment, as the World Health Organization (WHO) defines quality of life as individuals’ “perceptions of their position in life in the context of culture and value systems in which they live, and in relation to their goals, expectations, standards, and concerns”\(^29, \ 30, \ 34, \ 36\).

There is strong evidence that demonstrates children with untreated decayed teeth had significantly poorer oral health-related quality of life (OHRQoL) than children without decayed teeth as assessed both by the children and their parents\(^9, \ 10\). Other studies have shown that preschool children with a decayed tooth have a higher risk of increased days with restricted activity and absence from school, and a diminished ability to learn\(^11\). Further, caries in preschool children has an impact not only on the child’s educational development, but also on the economy of the family.
due to time taken off work by parents in order to take children to health care facilities\textsuperscript{12}. Moreover, research has shown that parents’ lack of knowledge and negative attitudes towards preschool oral health care or interventions are strongly associated with an increased caries experience in preschoolers\textsuperscript{7}.

There are a growing number of studies on dental caries status and OHRQoL in many countries, especially industrialized countries\textsuperscript{36}, however, published research regarding preschool children’s dental caries status and OHRQoL in Tanzania is minimal. While the results from studies based in other countries provide relevant information related to this subject\textsuperscript{36}, but these results cannot be entirely relatable to the preschool children in Tanzania.

In Tanzania, the first population-based study that systematically investigated dental caries to preschool children was conducted in Dar es Salaam and Hyvinkaa in 1991 by Kerosuo and Honkala\textsuperscript{13}. They assessed caries experience among 3 to 7-year-old Tanzanian and Finnish children. In all age groups, the Tanzanian children had higher mean dmft scores than Finnish children. In the Finnish group, the mean dmft score was higher at age 7 than at age 3, while in the Tanzanian group, no statistically significant difference in dmft scores was found between age groups\textsuperscript{13}. In both groups maxillary incisors and molars were the main teeth affected by caries.

Frequent consumption of sweet snacks and drinks increased the risk for caries in Tanzanian but not in Finnish children. High socioeconomic status decreased the risk for caries in Finnish children but among Tanzanian children high socioeconomic status was not associated significantly with the risk of developing caries\textsuperscript{13}. In another study, Matee and colleagues recruited children ages 1 to 4 from nine regions of Tanzania mainland, and reported prevalence varied from 1.5% in Dodoma
to 12.8% in Morogoro (rural)\textsuperscript{14}. In 2017, Mwakayoka and colleagues conducted a study in urban and peri-urban areas of the Mbeya region and reported a caries prevalence of 8.4% and 20.6% among 2-year-old and 3 to 4-year-old children, respectively. Evidence from studies conducted in Tanzania among preschool children has shown that children with poor oral hygiene had a statistically significantly higher prevalence of dental caries than their counterparts\textsuperscript{15}.

**Purpose**

The purpose of this study was to assess the prevalence of dental caries and its impacts on the oral health-related quality of life (OHRQoL) in a sample of preschool children aged 4-6 years in Kisarawe, Tanzania. Detailed information regarding the prevalence of dental caries and its impacts on OHRQoL provides a valuable tool in the planning, implementation and evaluation of oral health promotion programs. Such evidence is rare when it comes to preschool children in Tanzania.

**methods**

The present paper is based on data generated from a cross-sectional study conducted in Kisarawe district, one of the 6 districts in the Coastal Region of Tanzania. It is administratively divided into 15 wards which have a semi–urban rural population: Cholesamvula, Kibuta, Kiluvya, Kisarawe, Kurui, Mafizi, Maneromango, Marui, Marumbo, Masaki, Msanga, Msimbu, Mzenga, Vihingo, and Vikumbulu. The district is home to about 101,598 people, out of whom 2.77% is 4 years old, 2.81% is 5 years old and 2.83% is 6 years old\textsuperscript{16} and, had eighty-three registered preschools at the time of the study. The estimated sample size was calculated by assuming that the prevalence of dental caries in preschool children was 50%, with a
margin error of 5%, confidence level of 95%, a power of 90% and an assumed
design effect of 2. Another 5% was added to the sample size to account for non-
responses. A sample size (n = 1106) of this magnitude is sufficient to the pre-
calculated sample size of 810 preschool children.
Kisarawe district was conveniently chosen due to its rural (population of 84,174)
and semi-urban (population of 17,424) characteristics\textsuperscript{16}. The structure of the formal
education and training system in Tanzania constitutes of 2 years of pre-primary
education, 7 years of primary education, 4 years of secondary (Ordinary Level), 2
years of secondary (Advanced Level), and a minimum of 3 years of university
education\textsuperscript{35}. Official school age of pre-primary education is 4 - 6 years\textsuperscript{35}. One
preschool from each ward was randomly selected to participate in this study. Head-
teachers of the thirty-one selected schools were informed of the study and
requested to provide each child in the register a consent form for parents/guardians
to sign. The participating children were those who were in school at the time of the
survey and who were allowed to participate in the research through the Term of
Consent signed by parents or guardians and that allowed the clinical examination.
Permission was granted by the Medical Research Coordinating Committee of
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\textbf{Interviews}

An interview schedule was constructed in English and translated into Kiswahili, the
main language in Kisarawe. Kiswahili is the national language in Tanzania spoken
proficiently by almost 99% of the population. The interview schedule was translated
in several steps; from English into Kiswahili by bi-lingual Kiswahili/English
professionals, and then translated back to English by independent translators. Project professionals in the field reviewed the interview schedule for semantic, experiential and conceptual equivalence to the original version. Sensitivity to culture and selection of appropriate words were considered. The interview schedule was piloted and administered face-to-face before the children underwent a full oral clinical examination. Demographic characteristics were assessed in terms of preschool children’s age and sex. The Michigan Oral Health-related Quality of Life Scale (MOHRQoL) – Child Version, adapted from the work of Filstrup and colleagues, guided the selection of oral health-related quality of life variables and the multivariable analyses (Figure 1). The Michigan Oral Health-Related Quality of Life Questionnaire utilizes multidimensional scales to evaluate the OHRQoL of children. It is multidimensional because it includes items such as functional, social, and psychological aspects. This questionnaire consists of child and parent versions. It is intended for children 4 years of age and older. The child version contains items that were distributed throughout 3 areas, including pain, functional, and psychological aspects. Each interview of a preschool child was conducted in a private, quiet place outside the classroom and Yes = 1 and No = 0 responses to questions were noted. In this project, parents of preschoolers were also invited, but the number of parents who were present on the days of interview was not enough to include them in the analysis. Hence parent/proxy measure, which provides the ability for parents to answer in a more comprehensive method than children given their cognitive and perceptive abilities, was not the part of this study.

Clinical examination
Clinical oral examinations were conducted by trained and calibrated dentists (TN and LC), whereas trained assistants recorded the observations. Calibration exercises for the examiners with respect to childhood caries were carried out according to the guidelines published by the British Association of the Study of Community Dentistry (BASCD). Children were examined in knee-to-knee position using a dental mirror and natural light. Current oral hygiene in terms of visible plaque in the upper anterior teeth, central and lateral incisors (52, 51, 61, 62) and also canine (53, 63) each tooth was recorded as (0) No or (1) Yes. Dummy variables (0 = No, 1 = Yes) were summarized (range 0–6) and dichotomized into children with a count of a plaque score of 0 as having “good oral hygiene” while children with plaque score of one or more were regarded as having “poor oral hygiene”. Teeth were cleaned and dried by sterile gauze and inspected for dental caries using disposable dental mirrors. Dental caries status was accessed using the criteria recommended by the World Health Organization (WHO), Oral health surveys: Basic methods, 1997. Caries was limited to deciduous teeth and was diagnosed at cavitation level mainly by visual inspection and no radiographs were taken, and the presence of a carious lesion was scored = 1, while absence of any visible lesion was scored = 0. Those with a decayed component > 0 were regarded as having dental caries while those who had a decayed component = 0 were caries-free. The ‘missing’ and ‘filled’ components of the dmft were removed in analysis to avoid confusion for missing teeth due to caries or exfoliation and as there were no teeth that had been filled. In the present analysis, decayed teeth (dft) was used as dependent variable, both dichotomized as (0) absent (dft = 0) and (1) present (dft =1) and used as a count variable.
**Statistical analyses**

Predictive Analytics Software, IBM SPSS Statistics, version 20 was used for data analysis. Univariate analyses were performed by use of chi-square statistics. A probability value of $p<0.05$ was considered statistically significant. Multiple variable analyses were performed using logistic regression with odds ratios (OR) and 95% confidence intervals (CI) and Poisson regression with rate ratios (RR). Since using dummy variables runs the risk of losing information, results from logistic regression analyses were checked using Poisson regression with count variable were used to identify adjusted independent variables; demographic (age and sex), oral hygiene (plaque status) and measurement of OHRQoL by the Michigan Oral Health-related Quality of Life Scales (MOHRQoL) –children Version.

**Results**

**Sample characteristics and descriptive analyses**

Out of 1132 preschool children approached, 1106 agreed to participate, been 270 children of 4 years old (24.4%), 562 children of 5 years old (50.8%) and 274 children of 6 years of age (24.8%) corresponding to a response rate of 97.7%. Totals of 49.9% of the children investigated were females and the mean age was 4.97 years (SD 0.93). The decayed component was the most prevalent ($dft = 2.08$) and Significant Caries Index (SiC) was 5.54 double of the $dft$, showing polarization of dental caries in the studied population. As shown in Figure 2, the tooth specific pattern of caries was similar across preschool boys and girls in the study site. Maxillary central incisors and mandibular molar teeth were the most affected teeth both in preschool boys and girls. The frequency distribution of caries experience according to tooth type and sex showed that boys had consistently higher caries
experience than girls across all teeth. However, the caries rates were highest among 5 years preschool children for each tooth type as depicted in Figure 3. As shown in table 1 the frequency distribution of participants by dental caries experiences status (dependent variable) by demographic (age and sex), current oral hygiene status (visible plaque status) and measurement of OHRQoL by the Michigan Oral Health-related QOL Scales—children Version (independent variables). About one third (30.2%) of participating preschool children had caries experience, whereas nearly all (93.2%) of preschool children had visible plaque on buccal surfaces of upper anterior teeth. Twenty three percent of preschool children reported experience of tooth pain while less than twenty percent (18.5%) reported experience of pain on eating hot or cold. It was also found that majority (97.6%) of the preschool children reported to like their teeth, 98.2% were happy with appearance of their teeth and they can smile freely and only 6.3% reported that other kids made fun of their teeth.

Reliability and frequency of preschool children dental caries

Clinical oral examination of preschoolers was carried out by two trained and calibrated dentists (TN and LC). Prior to the fieldwork, the calibration for scoring preschool dental caries was conducted with the examiners, who underwent a training exercise for the diagnosis of preschooler dental caries. Calibration was performed using images of different clinical situations on two separate occasions with a one-week interval between sessions. The minimum intra-examiner agreement was 0.83 and the minimum inter-examiner agreement was 0.78. During the fieldwork, duplicate examinations one week apart were performed with 74 preschool children randomly chosen. Intra-examiner reliability in terms of Cohen's kappa ranged from 0.81 to 0.89, respectively. Test re-test reliability was not performed for
measurement of preschool children responses to the Michigan Oral Health-related Quality of Life (MOHRQoL) -children Version. The Pearson correlation coefficient for dft index (0 -11) and the Kiswahili version of MOHRQoL (0 - 9) was 0.152, which is significant (P<0.001 for a two paired test), based on 1106 complete observation (i.e. cases with non-missing value for both dft index and MOHRQoL index). The direction of this relationship is positive (i.e. dft index and MOHRQoL index are positively correlated) meaning that these variables tends to increase together (i.e. greater dft index is associated with greater MOHRQoL index), however the strength or effect size of this association is small (Correlation coefficients between 0.10 and 0.29 represent a small association). As shown in table 2, preschool children dental caries was significant, and it increased with age. Of the 334 children who experienced caries, 100 were children 4 years of age (37%), 184 were children 5 years of age (32.7%) and 50 were children 6 years of age (18.2%) \( \chi^2 = 26.276; p<0.05 \). The majority of preschool children with dental caries had visible plaque on the buccal surface of upper anterior teeth as compared to those without visible plaque \( \chi^2 = 14.562; p<0.05 \). Regarding measurements of oral health-related quality of life (OHRQoL) using a modified version of Michigan Oral Health-related Quality of Life Scale-Child Version, preschool children with a decayed tooth reported pain \( \chi^2 = 14.709; p<0.05 \) and waking up at night because of pain \( \chi^2 = 8.902; p<0.05 \).

**Adjusted factors for preschool children dental caries**

All variables of socio-demographic (age)-, oral hygiene behavioral (visible plaque on the buccal surface of upper anterior teeth)-, and measurements of a Kiswahili version of Michigan Oral Health-related Quality of Life Scale-Child Version, that
were statistically significantly associated with preschool dental caries status in univariate analyses (P<0.05) were included in multiple variable logistic regression analyses and Poisson regression analyses. As depicted in Table 3, Multivariate logistic regression assisted us gain a deeper understanding of the relationship between independent variables and dental caries status of preschool children. The final logistic regression model revealed that, preschool children of age 5 and 6 years old were more likely to have decayed tooth [Adjusted OR = 3.02, (95% CI =2.01-4.54)] and [Adjusted OR=2.23, (95% CI= 1.55-3.20)] respectively. Preschool without visible plaque in buccal surface of upper anterior teeth were less likely to have decayed teeth [Adjusted OR=0.21, (95% CI=0.09-0.45)]. Regarding measurements of oral health-related quality of life (OHRQoL) using a modified version of Michigan Oral Health-related Quality of Life Scale–Child Version, only preschool children who reported YES on ‘does your teeth hurt you now?’ and ‘do kids make fun of your teeth?’ were more likely to have a decayed tooth [Adjusted OR=1.74, (95% CI=1.12-2.71)] and [Adjusted OR=1.87, (95% CI=1.11-3.15)], respectively. Poisson regression confirmed the results from multiple variable logistic regression analysis presented in Table 3.

discussion

The purpose of this study was to explore the level to which dental caries impacts the oral health-related quality of life (OHRQoL) in a sample of preschool children in Kisarawe Tanzania. This is one of the first population-based studies to systematically investigate the correlates of dental caries and oral health-related quality of life of preschool children in Kisarawe, Tanzania. Thus, this study provides information about
preschool children that have not been well-covered by the national oral health survey in Tanzania. Information about the prevalence of dental caries in preschool children in sub-Saharan Africa is scarce, and the Kisarawe district has been surveyed to a very limited extent. There is a large body of literature that highlighted the role that individual distal factors such as socioeconomic, contextual factors such as availability and use of oral health services and, proximal factors such as consumption of sugary foods and drinks play an important role on determinants of oral health\textsuperscript{1, 33, 36}. However, in the present study, individual distal factors, the contextual factors and proximal factors such as consumption of sugary foods and drinks were not evaluated in this study. Other limitation of this study relates to the sample size and the fact that these results cannot be generalized to the entire population, because the sample calculation was drawn from a specific population (preschool children enrolled in public schools). High response rates and a limited number of missing items in the interview, however, suggest that the study group, for whom there are complete data, reflects preschool children (4–6 yrs.) living in the catchment areas of the public schools in Kisarawe districts.

In terms of child-attributed factors, the prevalence of preschooler dental caries was associated with age and oral hygiene. A tendency was found regarding a greater prevalence of preschooler dental caries associated with an increase in age, and with caries being more common among the six-year-olds, in agreement with findings reported in previous studies\textsuperscript{1, 2, 3}. This result can be explained that dental caries is a multifactorial chronic condition that requires time to develop and to be clinically detectable. So, the increase in the burden of dental caries disease due to age may be due by this and also, change in the dietary habits and hygiene practices in older
Dental caries is highlighted as one of the most common diseases in children and adults and a serious public health problem. The identification of groups at risk for disease development therefore presents fundamental importance for its prevention and early treatment. In the present study, a percentage of caries-free preschool children of 69.8% was found; this result was similar to the observed 59% among preschool children in Abu Dhabi, United Arab Emirates\textsuperscript{19} and 51% among preschool children in Hong Kong\textsuperscript{20}. However, the results found in this research were higher than the 80% of children who are caries-free children reported in Mbeya Tanzania\textsuperscript{15}. Differences in the reported prevalence of dental caries could be contributed to by the methodology employed in the different studies, age groups or it could be a fact that dental caries was prevalent in this study population.

Poor oral hygiene is one of the risk factors of preschooler’s dental caries\textsuperscript{1, 3}. The access of preschool children to different kind of toothbrushes (modern and traditional such as miswaki) and also, the use of fluoridated toothpaste were not evaluated in this study. The majority of the children in the present study exhibited poor oral hygiene, characterized by the presence of clinically visible plaque [93.2% (n=1031)]. Studies have documented an association between dental caries and tooth brushing supervision, and concluded that preschoolers do not yet have the manual dexterity needed for the maintenance of adequate oral hygiene\textsuperscript{1, 2, 3}. Consistent with international evidence, the present study demonstrated that preschoolers who had absent visible plaque were less likely to develop dental caries [Adjusted OR=0.21, (95% CI=0.09-0.45)]. As mothers or caregivers’ supervision during tooth brushing of preschoolers was not part of the present study, the high
prevalence of unsatisfactory oral hygiene may be explained by a lack of supervision of mothers or caregivers during tooth brushing, or else a lack of knowledge among parents regarding adequate oral hygiene practices\textsuperscript{2, 3}. Several instruments have been proposed to measure children’s quality of life and should be selected depending on the desired outcome and characteristics of the target population. These instruments should be easy to understand, have questions that are short, clear, simple, relevant to the objectives of the study, and previously validated and it should be noted that quality of life is a construct and cannot be directly measured\textsuperscript{8}. They include the Child Perceptions Questionnaire\textsuperscript{21}, the Child Oral Impacts on Daily Performances Index\textsuperscript{22}, the Child Oral Health Impact Profile\textsuperscript{23}, the Early Child Oral Health Impact Scale\textsuperscript{10} and the Scale of Oral Health Outcomes for 5-year-old children\textsuperscript{24}, the Michigan Oral Health-Related Quality of Life scale\textsuperscript{9} and the Pediatric Oral Health Related Quality of Life Measure\textsuperscript{25}. All but the Michigan Oral Health-Related Quality of Life scale\textsuperscript{9} and Early Child Oral Health Impact Scale\textsuperscript{10} were designed for self-report. The Michigan Oral Health-Related Quality of Life scale, MOHRQoL\textsuperscript{9} was chosen as the objectives of this study were to assess the effects of dental caries on oral health-related quality of life as reported by the children themselves of 4 years and above. Studies have documented that, when possible, both child and parents should be asked to provide ratings of OHRQoL in an effort to provide a more well-rounded depiction of the child’s oral health care needs and quality of life issues\textsuperscript{26}. Even if child’s opinion is the most valuable, there are certain factors which may compromise the reliability and validity of a child’s OHRQoL responses. Some of
these factors include: short-term memory, a strong influence of recent incidents, lack of a fully developed long-term perspective, language problems during interviews, and reading problems when completing a written questionnaire\textsuperscript{26}. In contrast to findings from this study that found fewer children with dental caries reported to be in pain, other studies report that the severity of dental caries has a negative influence on a child’s OHRQoL\textsuperscript{27}. This could be due to the fact that the acute stage in caries is cyclic in nature as a carious tooth may have become necrotic or created a fistula through the bone relieving the pressure and pain. It is also possible that these children have experienced chronic pain and may describe a tooth that is only slightly uncomfortable as not painful or that their tolerance to pain is high.

Similar to findings of this study, the most frequently reported impacts were ‘pain in the teeth, mouth, or jaws’\textsuperscript{28} and the associated pain from dental caries has a negative impact on children’s emotional status, sleep patterns, and ability to learn or perform their usual activities\textsuperscript{2}. Another study conducted among children and adolescents found a high dental caries experience and that dental caries had a negative impact on OHRQoL\textsuperscript{29}. From the child’s perspective, the sequela of dental caries could have been transient and that on the day of the interview the tooth no longer hurt. Or it is possible that the child felt that a tooth that spontaneously hurts throughout the day and/or night was worse than eating. The reported pain to the different questions indicates that dental caries goes through different stages. Contrastingly to findings from this study other studies observed that the prevalence of having an impact of dental caries was almost three times higher for children with dental caries with negative impacts on items related to pain, and to difficulty
drinking and eating some foods\textsuperscript{30}. In addition, another study found that an increase in the severity of early childhood caries resulted in the child’s having an impaired quality of life\textsuperscript{31}. The relatively low number of OHRQoL impacts found in this study can be attributed to the sample’s community-based nature and young age. To our knowledge in Tanzania, only the Masumo and colleagues\textsuperscript{10} has examined OHRQoL using Early Child Oral Health Impact Scale (ECOHIS) among infants and toddlers to-date. Taking OHRQoL impacts into account, however, can differentiate needs and help prioritize care for vulnerable populations\textsuperscript{22}. This information is important as most studies indicate a modest yet significant correlation between unmet needs like dental decay and children’s OHRQoL.

conclusions

In conclusion, the findings of the present study suggest that dental caries affects a significant portion of preschool children in Kisarawe district Tanzania and, was associated with poor oral hygiene. The overall impacts dental caries prevalence to OHRQoL were low in this sample of preschool children. The MOHRQoL scores demonstrated that preschool children who reported on ‘do your teeth hurt you now?’ and ‘do kids make fun of your teeth?’ were more likely to have a decayed tooth.

Future studies should assess risk indicators using longitudinal analyses. Detailed information regarding the prevalence of dental caries and its impacts on OHRQoL provides a valuable tool in the planning, implementation and evaluation of oral health promotion programs. Such evidence is rare when it comes to preschool children in Tanzania.
list of abbreviations

1. BASCD- British Association of Community Dentistry.
2. ECOHIS- Early Child Oral Health Impact Scale
3. MOHRQoL- Michigan Oral Health Related Quality of Life.
4. OHRQoL- Oral Health Related Quality of Life.
5. WHO- World Health Organization.

declarations

Ethics approval and consent to participate

Ethical approval was granted by the Medical Research Coordinating Committee of Muhimbili University of Health and Allied Sciences in Tanzania Ref. No. DA282/298/01.C. Participants were preschool children with signed consent by parents or guardians.

Consent for publication

The consent for publication was obtained from the Medical Research Coordinating Committee of Muhimbili University of Health and Allied Sciences in Tanzania Ref. No. DA282/298/01.C.

Availability of data and materials

Not applicable

Competing interests

The authors declare that they have no competing interests.

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Authors’ contributions

RMM participated in the design of the study, collected and analyzed data and prepared the first draft of the paper. TSN participated in the data collection data and helped with drafting the manuscript. LCC conceived the idea, participated in the design of the study, analyzed data and helped draft the manuscript. All authors have read and approved the final manuscript.

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tables

Table 1: Frequency distribution of study population attributes (n=1106)
| No | Variable                                      | Categories             |
|----|----------------------------------------------|------------------------|
| 1  | Age                                          | 4yrs 5yrs 6yrs Male Female |
| 2  | Sex                                          |                        |
| 3  | Decayed teeth                                | At least one tooth decay No teeth decay |
| 4  | Visible plaque                               |                        |
| 5  | Does your teeth hurt you now?                | Yes No                 |
| 6  | Does your tooth hurt when you eat something hot or cold? | Yes No |
| 7  | Does your tooth hurt when you eat something sweet? | Yes No |
| 8  | Does a hurting tooth wake you up at night?   | Yes No                 |
| 9  | Does a hurting tooth stop you from playing?  | Yes No                 |
| 10 | Is it hard for you to chew and bite?         | Yes No                 |
| 11 | Do you like your teeth?                      | Yes No                 |
| 12 | Are you happy with your teeth and smile?     | Yes No                 |
| 13 | Do kids make fun of your teeth?              | Yes No                 |

Table 2: Distribution of dental caries status of preschool children aged 4-6 years, univariate analysis (n=1106)
Table 3: Distribution of preschool dental caries status by socio-demographic (age), behavioral factor (current oral hygiene- visible plaque) and measurements of oral health-related quality of life (MOHRQoL, n = 1106)

| No | Variable                                      | Categories       | % (n)    | Adjusted OR; 95% CI     |
|----|-----------------------------------------------|------------------|----------|-------------------------|
| 1  | Age                                           |                  |          |                         |
|    |                                               | 4yrs             | 37 (100) | 1                       |
|    |                                               | 5yrs             | 32.7 (184) | 3.02 (2.01-4.54)       |
|    |                                               | 6yrs             | 18.2 (50)  | 2.23 (1.55-3.20)       |
| 2  | Visible plaque                                | Present          | 10.7 (8)  | 1                       |
|    |                                               | Absent           | 31.6 (326) | 0.21 (0.09-0.45)       |
| 3  | Does your teeth hurt you now?                 | No               | 39.9 (101) | 1                       |
|    |                                               | Yes              | 27.3 (233) | 1.74 (1.12-2.71)       |
| 4  | Does your teeth hurt when you eat something hot or cold? | No | 38.5 (79)  | 1                       |
|    |                                               | Yes              | 28.3 (255) | 0.89 (0.50-1.58)       |
| 5  | Does your teeth hurt when you eat something sweet? | No | 38.9 (79)  | 1                       |
|    |                                               | Yes              | 28.2 (255) | 0.91 (0.50-1.63)       |
| 6  | Does a hurting tooth wake you up at night?    | No               | 40.3 (64)  | 1                       |
|    |                                               | Yes              | 28.5 (270) | 1.41 (0.87-2.30)       |
| 7  | Do kids make fun of your teeth?               | No               | 47.1 (33)  | 1                       |
|    |                                               | Yes              | 29.1 (301) | 1.87 (1.11-3.15)       |

Figures
Screening questions for preschoolers
1. Do your teeth hurt you now?
2. Do your teeth hurt when you eat something hot or cold?
3. Do your teeth hurt when you eat something sweet?
4. Does a hurting tooth wake you up at night?
5. Does a hurting tooth stop you from playing?
6. Is it hard for you to chew and bite?
7. Do you like your teeth?
8. Are you happy with your teeth and smile?
9. Do kids make fun of your teeth?

Figure 1. **Michigan Oral Health-related Quality of Life Scale–Child Version**

**Figure 1**

*Michigan Oral Health-related Quality of Life Scale–Child Version*

**Figure 2**

*Distribution of preschool dental caries status according to sex in Kisarawe, Tanzania*
Figure 3

Distribution of preschool dental caries status according to age in Kisarawe, Tanzania