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Original Article

Gender and Age Disparities in Oral Health and OHRQoL in a Rural Tanzanian Community: Findings from the Rorya District

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ABSTRACT

Oral conditions play a major role in shaping everyday well-being, positioning them as a priority for worldwide health initiatives. This investigation outlines oral health patterns, perceptions, and clinical status among residents of Tanzania's Rorya district to better identify obstacles to care. To measure clinical oral status, adult participants underwent intraoral assessments documenting Decayed, Missing, and Filled Teeth (DMFT) and the Comprehensive Periodontal Inflammatory Burden Index (CPBI). Measures of Oral Health-Related Quality of Life (OHRQoL) and qualitative interviews were used to capture hygiene-related behaviors and beliefs. Quantitative results were processed using two-sample t-tests and Pearson statistics, while interview data were evaluated with NVIVO.A targeted sample of $n = 139$ individuals who reported living in Burere ($n = 32$), Nyambogo ($n = 52$), or Roche ($n = 55$) was included. Females ($n = 67$; $\bar{x} = 7.1$; $SD = 5.4$; $p < 0.05$) demonstrated significantly higher DMFT values compared to males ($n = 72$; $\bar{x} = 3.7$; $SD = 3.9$). Parallel findings were observed for OHRQoL, where women ($n = 67$; $\bar{x} = 12.10$; $SD = 14$; $p < 0.05$) exceeded men ($n = 72$; $\bar{x} = 10.16$; $SD = 3$). In contrast, mean CPBI was greater among males ($\bar{x} = 3.8$; $SD = 1.5$; $p < 0.05$) than females ($\bar{x} = 3.0$; $SD = 1.3$). Older adults showed elevated GI and PISA values, whereas participants aged 20–30 had the highest average DMFT. The qualitative interviews produced three main thematic categories: "pearls of laughter guarded by wisdom teeth," "whispered tales of oral tides and communal echoes," and "tales of the tooth fairy." Within this region, essential oral self-care behaviors are often neglected, largely due to inequitable access to dental resources, a pattern reflected in the clinical indicators. Correcting these disparities represents an important opportunity to enhance health and quality of life. The marked differences in outcomes across gender and age further emphasize the need for targeted health programs.

Keywords: Gender and age disparities, Oral health, OHRQoL, Tanzanian

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Introduction

Oral disorders are escalating globally as a public health challenge. Although they are mostly preventable and non-communicable, untreated periodontal disease, decayed teeth, tooth loss, oral cancers, and similar conditions continue to contribute heavily to international morbidity [1–3]. At the individual level, unresolved oral problems—pain, missing teeth, cavities, and reduced functionality—severely diminish everyday life. This is compounded by substantial evidence showing tight links between oral and systemic health [4–6]. Periodontal inflammation is associated with chronic illnesses such as cardiovascular disease and diabetes [6–9]. Consequently, the World Health Organization identifies oral health as a major marker of general well-being and social participation [10, 11].

Dental caries is the most prevalent global disease in many low-income regions, including East Africa [3, 12]. Its widespread occurrence can be traced to inadequate hygiene habits, restricted access to dental

providers, poor understanding of risk factors, and increased consumption of sugar-dense foods [13–15]. Severe oral diseases such as Cancrum oris ("noma") illustrate how malnutrition, poverty, and the absence of oral hygiene can lead to catastrophic tissue destruction [16, 17].

Communities with limited resources experience disproportionately high burdens of untreated decay, reflecting significant oral-health-related disability and mortality [18–20]. Contributing issues include few dental practitioners, geographical and financial barriers, and cultural misconceptions about oral care. These inequalities underscore the necessity of combining dental services with broader public health initiatives.

Foundational plaque-control practices—twice-daily brushing and consistent use of fluoride toothpaste—form the basis of oral disease prevention [21–23]. In regions with minimal access to professional care, oral-health education becomes indispensable, with numerous studies demonstrating that educational interventions can improve knowledge, shift attitudes, and encourage healthier hygiene routines.

Tanzania faces considerable oral health challenges. Research suggests that misuse of chewing sticks ("miswak") contributes to plaque build-up, calculus development, periodontal inflammation, tooth loss, and decay [24–27]. Practices such as toothbrush sharing, often prompted by scarce resources, create additional risks by facilitating infection transmission [28].

This study seeks to understand oral care routines, perceptions, and community knowledge by gathering brushing narratives from residents of the Rorya district in East Africa. These accounts, supported by focus groups, provide insight into local customs and attitudes surrounding oral hygiene.

As Oral Health-Related Quality of Life (OHRQoL) plays a central role in this research, OHRQoL is employed as an integrative measure incorporating functional ability, emotional well-being, expectations, satisfaction with care, and overall self-assessment [29, 30]. Along with OHRQoL, the DMFT index and Comprehensive Periodontal Inflammatory Burden Index (CPIBI) were applied to evaluate dental disease and inflammatory burden in adults. Altogether, the study offers an avenue for developing targeted oral health interventions. Ethical approval was obtained under UC protocol FWA#003152.

Materials and Methods

A total of 139 adults from the Rorya district in Tanzania were included through purposive recruitment, ensuring alignment with the project's aims. Eligible individuals were 18 years or older, long-term residents of Burere, Nyambogo, or Roche, and able to communicate in Swahili or English. Each person was assigned a six-digit identifier, which allowed data-tracking while keeping personal information anonymous.

For the quantitative phase, participants completed the validated OHRQoL tool [30] once at baseline. Dental assessments documenting the DMFT index (see Appendix Attachment 1) were performed using a portable chair and mobile lighting equipment. Measures contributing to the CPIBI—namely GI, BOP, and PISA—were also recorded.

The qualitative component relied on semi-structured guides for both individual interviews and focus groups, all audio-captured. Bilingual Swahili–English interpreters collaborated with University of Cincinnati (UC) team members and local oral-health volunteers to ensure concepts were culturally and linguistically congruent. Transcriptions were produced verbatim and stored on a password-protected device housed in a locked UC office.

After removing incomplete entries, all quantitative evaluations were carried out on the full dataset (n = 139). Using SAS 9.4, summary metrics were calculated for DMFT, GI, BOP, PISA, and CPIBI. Associations between indices were explored using Pearson correlations and logistic regression, while paired t-tests were applied to age-related comparisons. Qualitative material (n = 39) was coded descriptively [31] by two independent coders, one using NVivo 14.0 [32] and the other coding manually. Agreement between coders produced clustered categories that were then synthesized into study-driven themes.

To ensure data security, all files were encrypted and completely detached from any personal identifiers. Insights obtained across interviews, focus groups, and quantitative findings collectively informed the development of a locally relevant oral-health intervention. As compensation, participants received oral-care supplies and bilingual tooth-brushing instructions.

Results and Discussion

Participants and demographics

The sample (n = 139) self-identified residency as follows: Burere = 32, Nyambogo = 52, Roche = 55. A slight male majority was observed (n = 72; 51.79%). Participants' mean age was $\bar{x}$ = 42.38 years (SD ± 16.91) **(Table 1)**.

Table 1. Mean and standard deviation for DMFT and CPIBI.

Characteristic	n (%)	Decayed Mean (SD)	Missing Mean (SD)	Filled Mean (SD)	DMFT Mean (SD)	CPIBI Mean (SD)
Total sample	139 (100%)	3.8 (4.4)	1.5 (2.5)	0 (0)	5.2 (5.0)	5.5 (1.4)
Sex						
Males	72 (51.8%)	2.6 (3.4)	1.1 (1.9)	0 (0)	3.7 (3.9)	6.8 (1.5)
Females	67 (48.2%)	5.1 (4.9)	1.9 (2.9)	0 (0.1)	7.1 (5.4)	4.0 (1.3)
Age group (years)						
10–20	10 (7.2%)	4.1 (5.1)	1.2 (2.5)	0 (0)	5.3 (5.0)	3.0 (1.3)
20–30	32 (23.0%)	5.5 (5.0)	0.9 (1.2)	0 (0)	6.4 (5.5)	3.3 (1.5)
30–40	32 (23.0%)	3.0 (3.8)	0.9 (1.4)	0 (0.2)	4.0 (3.9)	2.9 (1.3)
40–50	17 (12.9%)	3.8 (4.0)	1.1 (2.5)	0 (0)	5.0 (4.7)	4.0 (1.4)
50–60	24 (17.3%)	3.0 (3.2)	1.5 (2.5)	0 (0)	4.5 (4.4)	3.8 (1.2)
60+	24 (17.3%)	3.0 (4.7)	3.5 (3.6)	0 (0)	6.5 (5.9)	4.0 (1.1)

+DMFT = Decayed (D) + Missing (M) + Filled (F) Teeth
aCPIBI = Comprehensive periodontal inflammatory burden index

DMFT

The group's mean DMFT score was $\bar{x} = 5.2$ (SD ± 5; range 0–24). A pronounced gender difference emerged: females showed significantly higher values ($\bar{x} = 7.1$; SD ± 5.4; $p < .001$) compared with males ($\bar{x} = 3.7$; SD ± 3.9). Age did not substantially predict DMFT outcomes, yet the intercept for sex remained significant ($p < .001$; coefficient = 3.13; SD ± 1.4), pointing toward additional, unmeasured contributors to this disparity.

CPIBI

Mean CPIBI for the cohort was $\bar{x} = 5.5$ (SD ± 1.41; range 1–7). According to two-sample t-testing, men exhibited higher periodontal-inflammation scores ($\bar{x} = 6.8$; SD ± 1.5; $p = 0.004$) than women ($\bar{x} = 4.0$; SD ± 1.3). Regression models revealed no meaningful demographic predictors for CPIBI.

GI

The gingival index averaged $\bar{x} = 0.98$ (SD = 0.90; range 0–3), consistent with mild inflammation. Differences between male ($\bar{x} = 1.1$; SD = 0.9) and female ($\bar{x} = 0.8$; SD = 0.9) participants did not meet statistical significance ($p = 0.058$). While GI showed no sex-linked associations, regression models identified a moderate positive correlation with age ($p = 0.001$), explaining 7.53% of total variance. Both sex ($p < 0.001$) and age ($p = 0.001$) were statistically relevant predictors overall.

OHRQoL

Participants reported an average OHRQoL score of $\bar{x} = 11.10$ (SD ± 4.72; range 3–18), where higher values represent worse quality of life. Females (n = 67; $\bar{x} = 12.10$; SD ±1.4) reported more impairment than males (n = 72; $\bar{x} = 10.16$; SD ± 3), with significance at $p \leq 0.05$.

Qualitative results

A subset of 36 participants contributed to the qualitative portion. Using a constant-comparison process, dual coders organized the dataset into clusters and then into six overarching themes that corresponded to the project's aims. These themes described household routines, cultural beliefs, and lived experiences that shape oral-health behaviors and OHRQoL. Three of the identified themes included:

1. Whispered tales of oral tides and communal echoes — influences of household and social environments on hygiene routines.
2. Pearls of laughter guarded by wisdom teeth — knowledge, beliefs, and daily habits related to oral care.
3. Tales of the tooth fairy — lifelong oral-health histories that contribute to reduced well-being.

Table 2. Thematic definitions.

Theme	Definition
Whispered tales of oral tides and communal echoes	This theme reflects the social dynamics, family interactions, and community influences that shape oral health-related behaviors and practices.
Pearls of laughter guarded by wisdom teeth	This theme encompasses participants' knowledge, attitudes, beliefs, cultural interpretations, and traditional practices surrounding oral health and hygiene.
Tales of the tooth fairy	This theme describes lifelong self-reported oral hygiene habits and behaviors that participants link to their current poor oral health status and diminished oral health-related quality of life.

Quantitative findings

All villagers who were eligible (n = 139) completed the quantitative component.

Theme 1: Household patterns and social forces shaping oral hygiene

This theme describes how domestic arrangements and collective routines influenced everyday oral-care choices. In the Rorya district, oral-hygiene responsibilities varied sharply by age group and economic position. Households reported an average of seven residents, typically four adults and three children.

Among the adults who described their brushing frequency (n = 39), responses ranged from once daily (n = 9), to twice daily (n = 5), to three times per day (n = 3). The tools used included plastic brushes (n = 12), "miswak" sticks (n = 21), or a mix of the two (n = 18). Access, affordability, and gender-related expectations shaped these choices. One woman (38 years old; mother of six) explained, "My spouse and children have their own toothbrushes; I just use whatever is available, but everyone here uses toothpaste."

Participants (n = 24) also discussed their children's brushing habits: brushing once daily (n = 6) or twice daily (n = 2). Financial constraints and concerns about toothpaste ingestion were frequently reported barriers. As a 42-year-old father of five noted, "Sometimes they use toothpaste, sometimes not — it depends on money." Another parent avoided giving toothpaste because they worried children would swallow it.

Social contexts within the home further shaped hygiene practices. Most respondents (n = 39) brushed outside their homes; only one person (n = 1) did so indoors. Post-HIV health awareness emerged as an influential factor: nine villagers emphasized avoiding shared hygiene items, including one man (36 years old) who said, "After HIV became known here, no one shares a toothbrush."

Smoking (n = 22) and passive exposure (n = 19) — from cigarettes, cooking fires, charcoal (n = 16), and burning wood (n = 16) — were common and perceived to affect oral health. Environmental smoke was described as unavoidable; one older woman (62 years) remarked, "Whenever we cook, we inhale fumes, and it even eases tooth pain."

Taken together, these findings show that oral-care behavior is deeply embedded in family routines, material constraints, and community norms.

Theme 2: Knowledge systems, beliefs, and resource-driven hygiene strategies

This theme highlights how villagers understood oral cleanliness, the reasoning behind their habits, and their improvisation with available tools.

Indicators of "clean teeth" included brushing (n = 32), absence of bad breath (n = 5), visibly clean teeth (n = 3), and uncertainty (n = 2). Morning brushing was favored (n = 20), with motivations such as removing food debris (n = 4), achieving a refreshed feeling (n = 4), or simply following routine (n = 5). A 32-year-old woman explained, "I brush in the morning when I wake up and feel food remains in my mouth. When I have pain, I sometimes use a stick — it helps."

Villagers frequently adapted tools according to what they had: sticks (n = 15), fingers (n = 4), and salt (n = 1). Replacement of tools was usually prompted by deterioration — worn surfaces (n = 8), frayed bristles (n = 4), bristles becoming stiff (n = 4), or reduced cleaning ability (n = 1).

Toothpaste availability varied, with brands like Colgate® (n = 12) and Whitedent® (n = 11) used irregularly. Brushing methods differed as well: a front-to-back motion (n = 22) or mixed, less defined techniques (n = 8). Rinsing after brushing was common (n = 28); water sources included wells (n = 14), rainwater (n = 11), dams (n = 10), and lakes/rivers (n = 9).

Storage of tools also varied widely — cups (n = 13), rooftops (n = 10), pockets or pouches (n = 2), wall crevices (n = 1), boxes (n = 1), or baskets (n = 1). Brushing duration shifted depending on daily tasks such as farming and water collection, ranging from short sessions of 1–2 minutes to extended periods while performing chores. Oral care was therefore intertwined with daily activities rather than treated as a separate task.

Theme 3: Development of oral practices and the community's dental history

This theme traces how villagers learned toothbrushing behaviors and how dental problems accumulate over time.

Adults reported beginning toothbrushing around age 10, while they introduced their own children to brushing at approximately age 5. Sources of oral-health instruction included observation or guidance (n = 24), school (n = 15), mothers (n = 8), fathers (n = 3), both parents (n = 8), or other individuals (n = 1). One woman recalled adopting brushing simply after watching her brother and father and then asking for a toothbrush.

Despite these learning pathways, villagers commonly experienced untreated dental conditions: persistent pain (n = 19), cavities or "holes" (n = 15), swelling (n = 6), chewing difficulty and bleeding (n = 10), gum issues (n = 4), sensitivity (n = 2), bad odor (n = 2), tooth looseness (n = 1), and cracked teeth (n = 1). One woman commented, "My teeth are painful; some have holes that cause swelling."

To manage these issues, villagers often relied on local solutions — herbs (n = 9), toothpaste combined with soot or salt (n = 12), sticks (n = 11), and unconventional materials such as paper or petrol (n = 5). Some residents sought formal care at hospitals (n = 11) or pharmacies (n = 7), while others had never obtained professional treatment at all (n = 16).

This study reinforced the importance of oral health as a critical contributor to overall well-being. The findings are consistent with prior reports indicating high oral disease prevalence and elevated DMFT scores across East Africa and Tanzania [31, 32]. The results also highlighted multiple contributing factors to widespread dental caries in the Rorya district, including limited access to oral health services and a near-zero filled-teeth subindex, even among individuals aware of decay risks. These trends illustrate a reactive rather than preventive approach to dental care, where villagers typically sought professional attention only under severe circumstances, often resulting in extractions rather than restorative or preventive interventions.

Economic limitations significantly influenced oral disease burden, as access to toothbrushes and fluoridated toothpaste was inconsistent, creating a gap in preventive care [33]. Consequently, villagers relied heavily on traditional oral hygiene methods such as chewing sticks. Although these tools can assist in plaque removal, they lack the benefits of fluoridation and may cause tooth wear with long-term use [34, 35].

Gender differences were also evident: women presented higher DMFT scores, whereas men had elevated CPIBI values and more pronounced gingival inflammation, potentially due to environmental exposures, including secondhand smoke [36, 37]. Gender-specific roles and cultural norms shaped hygiene behaviors, with many women preferring miswak over modern toothbrushes. These disparities, coupled with late initiation of tooth brushing and suboptimal diets, increase the risk for oral diseases, including oral cancers, and reduce quality of life.

Age-related trends were also observed. Older participants exhibited higher GI and PISA scores, previously linked to greater susceptibility to systemic conditions such as diabetes and cardiovascular disease [4]. These findings underscore the need for interventions that address oral health in tandem with chronic disease management. The implementation of tailored, sustainable oral health programs is crucial in the region, not only for improving oral outcomes but also for supporting broader public health goals, including equity, education, and socio-economic development [38, 39].

Conclusion

This investigation offers a comprehensive view of oral health conditions in the Rorya district, emphasizing the direct connection between oral hygiene and quality of life.

Our results demonstrate that cultural practices, resource limitations, and gaps in oral health knowledge have collectively contributed to a significant dental disease burden. Notably, disparities were most pronounced among women and younger participants, who exhibited higher mean DMFT scores, challenging the assumption that oral health issues primarily affect older adults. Future strategies should focus on delivering accessible and culturally appropriate oral health interventions to these communities, addressing structural barriers to care while promoting preventive practices.

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Ethics Statement: The studies involving humans were approved by University of Cincinnati Institutional Review Board. The studies were conducted in accordance with the local legislation and institutional

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