

The Impact of Early Childhood Caries on the Quality of Life of 3-6 Year Old Children and their Parents Visiting Teacher Dental Hospital in Peshawar

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Abstract

Background: Early childhood caries (ECC) is a widespread public health issue that mainly affects young children and increases the risk of future tooth decay. As a chronic infectious disease that is not resolved on its own, untreated ECC can severely impact oral and overall health, reducing quality of life.

Objectives: The primary aim of the study was to assess the impact of early childhood caries on the quality of life of 3-6 year old children and their parents visiting dental hospitals in Peshawar. A secondary objective was to translate and validate the ECOHIS questionnaire in Urdu.

Method: A cross-sectional design was employed, enrolling 400 children through consecutive non-probability sampling. Clinical assessment of ECC severity was performed using the decayed, missing, and filled teeth (dmft) index, categorizing cases as mild, moderate, or severe. QoL data were collected using the ECOHIS questionnaire. Statistical analyses were conducted using SPSS version 22.0.

Result: The mean age of participants was 2.58 ± 1.13 years, with a male-to-female ratio of 1:0.8. Severe ECC (S-ECC) was identified in 41.5% of children. ECOHIS scores demonstrated a significant positive correlation with ECC severity ($P < 0.001$), effectively differentiating severity groups. Approximately 38.5% of children exhibited high total ECOHIS scores, reflecting substantial QoL impairment. In the child impact section (CIS), 55% reported high impact levels, predominantly within the functional domain (73.2%). Within the family impact section (FIS), 40.2% of parents reported low impact, although financial burden was frequently reported (54.4%).

Conclusions: Severe ECC significantly compromises pediatric QoL through pain, functional limitations, and sleep disturbances, while also imposing psychological and financial burdens on parents.

Keywords: Early childhood caries (ECC), Quality of life (QoL), Oral health related quality of life (OHRQoL), Early childhood oral health impact scale (ECOHIS).

Introduction

Dental caries is a progressive, chronic disease driven by multiple factors such as diet, biofilm, host susceptibility, and social determinants. It remains significantly prevalent conditions affecting children globally.¹ Despite advances in prevention and treatment, its incidence has not declined in many regions, making it the third most common non-communicable disease as classified by the WHO.² Early childhood caries (ECC) defined as decayed, missing, or filled primary teeth (DMFT) in

children under six³ causes functional impairments such as chewing inefficiency, speech difficulties, and aesthetic concerns, contributing to psychological distress.^{4,5} Children from low-income backgrounds face twice the risk of untreated caries due to limited healthcare access⁶, exacerbating systemic impacts like malnutrition⁷ and developmental delays. The condition's irreversible progression and economic burden as evidenced by 60 million lost school hours annually⁵ signify it as a priority for intervention.

The literature on childhood dental caries highlights its complex etiology, involving biological, behavioral, and psychosocial factors.⁸ Key risk drivers include frequent sugar consumption⁹ poor oral hygiene¹⁰, and socioeconomic disparities¹¹, with cariogenic bacteria like *Streptococcus mutans* colonizing tooth surfaces through maternal transmission.¹² Structural vulnerabilities in primary teeth, such as immature enamel¹³ and reduced salivary protection at night¹⁴, accelerate decay. Bottle-feeding practices¹⁵ and prolonged breastfeeding¹⁶ significantly influence prevalence, while fluoride use remains underutilized in high-risk

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populations.¹⁷ Global prevalence varies widely, from 5% in developed nations¹⁸ to 85% in marginalized communities like Peshawar, Pakistan¹⁹, reflecting healthcare inequities.

Dental caries significantly reduces the quality of life (QoL) of children by causing pain, sleep disturbances, and poor school performance, while also impacting parents through emotional stress and work absenteeism. Treatment leads to improved child well-being and reduces the burden on families. ECOHIS serves as a validated tool to measure these repercussions. This study addresses the lack of region-specific data on the psychosocial effects of early childhood caries (ECC) in Pakistan. By analyzing the relationship between caries severity, assessed via the dmft (decayed, missing, filled teeth) index and oral health-related quality of life (OHRQoL) among preschoolers in Peshawar, the research aims to achieve two objectives: Firstly, to assess the impact of early childhood caries on the quality of life of 3-6 year old children and their parents visiting dental hospitals in Peshawar and secondly to translate and validate the ECOHIS questionnaire in Urdu.

Material and Methods

A hospital-based cross-sectional study was conducted across three tertiary dental hospitals in Peshawar, Pakistan (Khyber College of Dentistry, Peshawar Dental College and Sardar Begum Dental College). Ethical Approval was taken from Peshawar Dental College (IIMC/RSRC/03/15). Consecutive sampling was employed to recruit 400 preschool children aged 3–6 years (mean: 2.58 ± 1.13 years; 53.8% male), with sample size calculated using epi info calculator (95% confidence interval)²⁰, yielding 385 participants, which were increased to 400 to tackle nonresponse rate. Inclusion criteria required children to be accompanied by parents/guardians and free of systemic diseases (parent-reported). Exclusion criteria included congenital syn-

dromes, anodontia, or age outside 3–6 years.

Data were collected using the ECOHIS, a validated 13-item instrument assessing oral health-related quality of life (OHRQoL) across family (distress, function) and child (symptoms, function, psychology, self-image) domains. The ECOHIS was translated into Urdu via forward-backward translation by linguistics experts at Peshawar University, with pilot testing (n=20) confirming test-retest reliability (intraclass correlation coefficient [ICC] = 0.73). Clinical examinations followed WHO criteria, with caries severity classified using the decayed, missing, and filled teeth (dmft) index: 0 (caries-free), 1–3 (low), 4–5 (moderate), and ≥ 6 (high).

Examiners used sterilized mouth mirrors and probes under standardized lighting, adhering to biosafety protocols (disposable gloves, masks). Socioeconomic status (SES) was categorized as low (<Rs 20,000/month), medium (Rs 20,000–50,000), or high (>Rs 50,000) based on parental occupation, education, and income.²¹ Written consent was obtained from the parents. Data analysis was performed using IBM SPSS Statistics v22.0, including descriptive statistics, one-way ANOVA for group comparisons, and Spearman's rank correlation ($\alpha=0.01$) to assess associations between dmft scores and ECOHIS outcomes. Internal consistency of ECOHIS was evaluated via Cronbach's alpha (total: 0.86; child section: 0.78; family section: 0.82).

Results

A total of 400 child–parent dyads were enrolled (mean child age 2.58 ± 1.13 years). Mostly fathers aged 31–40 years (47.5%) with no formal schooling (68.8%) accompanied the children, and 64.0% of families fell into the low-income bracket (< 20,000 Rs). Severe ECC (dmft ≥ 6) affected 41.5% of chil-

Table 1: Demographics and dmft scores

Characteristic	Category	n (%)	Characteristic	Category	n (%)	
Age group (years)	3	93 (23.3)	Relationship to child	Father	218 (54.5)	
	4	94 (23.5)		Mother	172 (43.0)	
	5	100 (25.0)		Guardian/other	10 (2.5)	
	6	113 (28.2)		Parent education	275 (68.8)	
Gender	Male	215 (53.8)	Parent education	Primary	49 (12.3)	
	Female	185 (46.3)		Secondary	45 (11.3)	
Parent age (years)	20–30	164 (41.0)	Employment status	Tertiary or above	31 (7.8)	
	31–40	190 (47.5)		Employed	224 (56.0)	
	41–50	46 (11.5)		Unemployed	176 (44.0)	
ECC severity (dmft)	Mild (1–3)	141 (35.3)	Socioeconomic status (Rs/month)	Low (< 20 000)	256 (64.0)	
	Moderate (4–5)	93 (23.3)		Medium (20 000–50 000)	83 (20.8)	
				High (> 50 000)	61 (15.3)	

Table 2: Distribution of ECOHIS response

Impacts	Never and hardly ever N (%)	Occasionally, Often, Very often N (%)	Don't Know N (%)
Child Impact How often has your child had pain in the teeth, mouth or jaws?	107 (26.7)	293 (73.2)	0 (0)
How often has your child, because of dental problems or dental treatments had?			
Difficulty drinking hot or cold beverage	114 (28.5)	286 (71.5)	0 (0)
Difficulty eating some food	189 (47.3)	211 (52.5)	0 (0)
Difficulty pronouncing any words	339 (84.8)	56 (14)	5 (1.2)
Missed preschool, daycare or school	252 (63.0)	148 (37.0)	0 (0)
Trouble sleeping	164 (41.0)	236 (59.0)	0 (0)
Been irritable or frustrated	281 (70.3)	117 (29.3)	2 (0.5)
Avoided smiling or laughing	341 (85.3)	47 (11.7)	12 (3)
Avoided talking	353 (88.3)	47 (11.7)	0 (0)
Family Impact How often have you or another family member, because of your child's dental problems or dental treatments?			
Been upset	221 (55.3)	179 (44.5)	0 (0)
Felt guilty	290 (72.5)	110 (27.5)	0 (0)
had a financial impact on your family	182 (45.5)	218 (54.5)	0 (0)
taken time off from work	253 (63.2)	147 (36.8)	0 (0)

dren as shown in table 1, and ECOHIS responses indicated that "pain in the teeth, mouth or jaws" was the most common child-impact (73.2%), while "financial impact" was the most common family-impact (54.5%), other important child and family impacts are mentioned in table 2. Key functional impairments included difficulty drinking/eating (71.5%/52.5%) and sleep disturbances (59%).

The results of the study are divided into three sections, demographics and dmft scores (table 1), the psychometric validation of the Urdu ECOHIS (table 2, 3, 4, 5) and the statistical correlations (table 6).

The psychometric analysis of the Early Childhood Oral Health Impact Scale demonstrated excellent internal consistency and satisfactory stability over time. Cronbach's alpha coefficients were 0.86 for the overall 13-item instrument, 0.78 for the 9-item Child Impact Section, and 0.82 for the 4-item Family Impact Section, indicating high reliability as shown in table 3. Corrected item-total correlations ranged from 0.261 (for "avoided smiling or laughing") to 0.702 ("been irritable or frustrated"), with all items contributing positively to scale coherence, detail correlation for each item provided in table 5. Test-retest reproducibility, assessed in 20 caregiver-child dyads, yielded an intraclass correlation coefficient of 0.73 (95% CI: 0.671–0.778), confirming the measure's temporal stability.

Negative correlations were observed between SES and ECC ($r = -0.460$, $p < 0.01$) and between SES and

ECOHIS total scores ($r = -0.212$, $p < 0.01$), indicating that children from lower socioeconomic backgrounds had more severe caries and poorer oral health-related quality of life.

A strong positive correlations ($r = 0.609$, $p < 0.01$), confirming that increased caries severity is associated with worse quality of life.

Mean ECOHIS scores increased ion was found between ECC and ECOHIS total significantly with the severity of ECC ($p < 0.001$, ANOVA). This indicates a graded relationship between disease severity and quality of life impairment.

Similarly, ECOHIS scores were significantly higher among children categorized by impact levels: Weak impact: 1.37 ± 0.63 , Moderate impact: 1.88 ± 0.82 , High impact: 2.69 ± 0.61 ($p < 0.001$, ANOVA), which show that higher perceived impact correlates with worse OHRQoL.

Both the Child Impact Section and Family Impact Section of the ECOHIS showed strong correlations with ECC, with 55% of children falling into the high-impact category for child-related QoL (CIS score 25–36), while only 26.8% of parents reporting high scores in the family impact section (FIS), indicating substantial emotional and financial stress. Spearman's correlation confirmed a strong positive association between ECC and both child and family impact scores ($r = 0.594$ and $r = 0.595$, $p < 0.001$), confirming that caries significantly affect not only the child but also the family's well-being. (Table:6)

Discussion

Table 3: Reliability analysis internal consistency of ECOHIS

ECOHIS	ECOHIS Mean (number of items)	Standard Deviation (SD)	Internal consistency reliability (Cronbach's alpha) (N=400)
Child impact section	9	1.37	± 1.1 0.78
Family impact section		1.35	± 1.2 0.82
Total ECOHIS score	13	1.67	± 0.6 0.86

Table 4: Reliability analysis test-retest intra-class consistency (ICC)

	Intraclass Correlation (N=20)	95% Confidence Interval	
		Lower bound	Upper bound
ECOHIS (13 items)	0.73	.671	.778

Table 5: Internal consistency reliability of Urdu ECOHIS: Item-total statistics

Variables	Corrected item-total correlation	Cronbach's Alpha if item deleted
Pain in teeth, mouth or jaw	.581	.852
Difficulty in drinking	.573	.852
Difficulty in eating	.696	.845
Difficulty in pronouncing	.297	.867
Missed school	.311	.866
Trouble sleeping	.556	.854
Frustrated/irritated	.702	.845
Avoided smiling or laughing	.261	.870
Avoided talking	.359	.864
Been upset	.640	.848
Felt guilty	.648	.848
Taken time off from work	.610	.850
Financial impact	.652	.847

Table 6: Early Childhood Caries(ECC),Early Childhood Oral Health Impact Scale (ECOHIS) and Socioeconomic status(SES) Correlations and Scores

Category	Measure	Value (Mean \pm S D or r)	p-value
Spearman correlations	SES – ECC	$r = -0.460$	$p < 0.01$
	SES – ECOHIS (total)	$r = -0.212$	$p < 0.01$
	ECC – ECOHIS (total)	$r = 0.609$	$p < 0.01$
Mean ECOHIS by ECC severity	Mild ECC	1.23 ± 0.47	$p < 0.001$ (ANOVA)
	Moderate ECC	1.54 ± 0.62	
	Severe ECC	2.12 ± 0.59	
Mean ECOHIS by impact level	Weak impact	1.37 ± 0.63	$p < 0.001$ (ANOVA)
	Moderate impact	1.88 ± 0.82	
	High impact	2.69 ± 0.61	
ECC vs ECOHIS sections	Child Impact Section	$r = 0.594$	$p < 0.001$
	Family Impact Section	$r = 0.595$	$p < 0.001$

This cross-sectional study assessed early childhood caries (ECC), clinical and socio-demographic factors, and their impact on oral health-related quality of life (OHRQoL) among 3–6-year-old children and their parents attending three tertiary dental hospitals in Peshawar. The mean age was 2.58 years, with six-year-olds constituting the largest group (28%). Most of the children reporting to the hospital with ECC were male. Therefore, most of the population in this study was male (53.75%). This trend might be due to cultural norms observed in our society where boys are given preference over girls regarding their health needs. A previous study conducted in Peshawar reported higher occurrence of ECC in boys (57%) than their counterparts.²² A study conducted in Iran in 2015, also revealed similar trends.²³

Fathers were the primary proxy respondents, differing from previous studies where mothers commonly reported on children's oral health.^{24,25} This trend might be due to the cultural norms of our society in which fathers are considered/preferred the caregivers outside the house. This may reflect hospital-based sampling dynamics rather than broader population trends.

A majority (64%) of participants belonged to low socioeconomic backgrounds, correlating significantly with ECC severity and poor OHRQoL outcomes (Table 6). This finding was in accordance with the previously comprehensive review by Milnes et al, consisting of studies from Europe, Africa, Asia, Middle East and North America reported that socially deprived families showed increased ECC prevalence about 70%. Another study conducted in Brazil confirmed that uneducated parents who earned a lower income were more likely to rate their child's health status as 'poor'.²⁶ It was observed that age, socioeconomic status, caries experience and severity was associated with toothache, disturbed sleep and eating habits, which negatively affects children's quality of life.²⁷

The Urdu version of the ECOHIS instrument demonstrated acceptable reliability (Cronbach's α = 0.86; ICC = 0.73), comparable to other validated international versions.^{5,8} The domains most affected were pain and functional limitations in the child section, with financial impact most reported in the family section.^{9,12} Severe ECC significantly increased ECOHIS scores, indicating a worse OHRQoL, consistent with previous research.^{13,15} Interestingly, the child self-image domain showed no significant correlation, possibly due to proxy bias or lack of awareness.¹⁶

About 38.5% of the participants experienced a high impact of ECC on quality of life. Overall, a strong positive correlation existed between caries severity and ECOHIS scores, supporting its construct validity.¹⁷ The study emphasizes the critical need for early intervention and community-level oral health education programs to improve awareness and reduce ECC burden among children and families in low-resource settings.^{18,20}

The Urdu version of ECOHIS showed excellent reliability and validity, with Cronbach's alpha of 0.86 and ICC of 0.73 (Tables 4). Internal consistency was comparable to other validated versions, that aligned with Lithuanian²⁸, Chinese²⁹, and French versions, though Farsi/Turkish adaptations reported higher α values.^{24,30} This highlights its suitability as a culturally relevant and psychometrically sound tool for assessing the impact of ECC on OHRQoL in Urdu-speaking populations.

The maximum ECOHIS scores recorded were consistent with prior research.⁴ Most parents reported impacts like pain and difficulty drinking rather than social impacts like self-image (Table 5), echoing trends seen in Brazil and China, suggesting that parents are more attuned to visible physical symptoms than psychological or social effects.³¹ Additionally the low

"don't know" response rate (5%) indicates that the Urdu ECOHIS was well understood and relevant for this population, reinforcing its cultural and contextual appropriateness.

Child impact domains, especially pain and eating difficulties, were more frequently reported than family impact domains. Financial strain was the most reported family concern, likely reflecting the predominance of low-income families. This matches findings from a study conducted in Bauru by Xavier et al. in 2012³², highlighting the burden of untreated caries on family well-being and healthcare utilization.

ECC severity showed significant associations with all ECOHIS domains except self-image, which was an unusual finding in this study as compare to previously conducted studies³³, possibly due to proxy respondent bias, where most caregivers were fathers with limited insight into children's emotional well-being and the generally low oral health awareness in the study population. It was observed that an increase in total ECOHIS scores with rising caries severity aligns with international research, reinforcing the direct link between disease burden and diminished quality of life.³⁴

ECC profoundly affects young children's general health, causing pain, nutritional problems, speech difficulties, and emotional disturbances.^{25,35} Premature loss of primary teeth compromises phonetics and aesthetics, damaging self-esteem and social interactions. These findings underline the urgent need for public health programs, targeting parental education and early prevention to safeguard children's oral and general health.

Limitations

Limitations of this study include its cross-sectional design and use of a convenience sample in urban schools, which may not represent rural or other populations. Future longitudinal studies could establish causality and assess the effectiveness of preventive programs. Nonetheless, the present findings highlight the burden of ECC and its consequences for child well-being in our community.

Conclusion

Early childhood caries is highly prevalent among preschool children in Peshawar and is significantly associated with poorer oral health-related quality of life. Children with ECC experience more pain and functional limitations than caries-free peers. These results emphasize the need for community-based preventive strategies and parental awareness programs to reduce ECC and enhance the oral health-related quality of

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Author Contributions

1. **Kanwal Nazir Arbab:** Conception and design of the study, data collection, and manuscript drafting.
2. **Aliya Khan:** Data analysis, interpretation of results, and critical revision of the manuscript.
3. **Sami Salleh Khan:** Assisted in data collection and literature review.
4. **Sheema Arbab:** Contributed to questionnaire development and data organization.
5. **Sana Idress:** Assisted in statistical analysis and formatting of the manuscript.
6. **Zia Ur Rehman:** Supervised the study, reviewed the final draft, and approved the manuscript for submission.