

# Oral Health Related Quality of Life and its Association with Dental Caries of Preschool Children in Urban and Rural Areas of India

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**Background:** In early childhood due to dental neglect, children suffer from multiple decayed teeth and experience pain, interfering with their daily activities. This study aimed to assess Oral Health Related Quality of Life (OHRQoL) of preschool children in urban and rural Bangalore, and to correlate it with their dental caries status. **Study design:** Oral health examination of 1545 preschool children, aged 3 to 5 years were selected from urban and rural Bangalore. The parents answered the Oral Health-Related Early Childhood Quality of Life OH-ECQOL proforma on OHRQoL of their children. **Results:** The mean OHRQoL of urban preschool children was 17.86 and was significantly different from 20.42 of rural preschool children. ( $p < 0.001$ ). The mean deft score was  $2.60 \pm 2.26$  in rural preschool children and it was significantly higher than  $1.92 \pm 2.05$  seen in urban preschool children ( $p < 0.001$ ). A significant correlation was seen between dental caries (def) and OHRQoL in urban preschool children ( $p = 0.04$ ). Their OHRQoL was significantly associated with the 'decayed' component. ( $p = 0.03$ ) Multiple regression analysis showed OHRQoL to be significantly associated with dental caries. **Conclusion:** OHRQoL among preschool children living in urban Bangalore was found to be better than those in rural Bangalore.

**Keywords:** Quality of life; dental caries; preschool children; OHRQoL; OH-ECQOL; rural; urban.

## INTRODUCTION

Oral health is defined as the standard of oral and related tissue health that enables an individual to eat, speak and socialize without active disease, discomfort or embarrassment, and it contributes to general well-being. Traditional methods for assessing oral health mainly use clinical indices and focus on the absence or presence of oral diseases without information about the oral well-being of people. Hence quality of life has been used to evaluate both the physical and psychosocial impact of oral health.<sup>1</sup> Oral Health-Related Quality of Life (OHRQoL) is "the impact of oral diseases and disorders on aspects of everyday life that a patient or person values, that are of sufficient magnitude, in terms of frequency, severity or duration to affect their experience and perception of their life overall".<sup>2</sup>

Dental caries in preschool children has an early bearing on the quality of life for both children and family. Tooth decay causes functional changes, such as difficulty in chewing, speech impairment, and school absenteeism. They also display impaired psychological aspects, difficulty sleeping, irritability, affects weight gain and overall growth and development. The impact of oral health of a child, impacts his or her family's quality of life. It is related to the concern or neglect shown by caregivers about their child's situation. Severe dental caries can result in parents/caregivers missing days of work and greater financial expenditure, with a consequent negative impact on the OHRQoL of the family.<sup>3,4</sup> Dental caries is

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also associated with low educational attainment among mothers.<sup>5</sup> This results in a negative impact on the quality of children's lives. Therefore, it is important to monitor oral health of preschoolers.<sup>6,7</sup>

Since oral health affects the general well-being, various tools have been used to assess the OHRQoL in children. These include the Early Child Oral Health Impact Scale (ECOHIS),<sup>7</sup> the Pediatric Oral Health-Related Quality of Life (POQL), the Child-Oral Impacts on Daily Performances Index (Child-OIDP) and Child Perception Questionnaire (CPQ). Some tools have been used on older children and adolescents.<sup>8-10</sup> Recently, the tool Oral Health-Related Early Childhood Quality of Life (OH-ECQOL) has been validated where the parents responded to their children's Quality of Life.<sup>8</sup>

Almost two-third of India's population reside in rural India with diverse geographic, climate, cultural, ethnic and socio-economic differences.<sup>11</sup> Cultural beliefs may strongly guide one's expectations for health and care-seeking behaviour which may vary in urban and rural areas.<sup>12,13</sup> Very few Indian studies have assessed OHRQoL among preschool children.<sup>14-16</sup> Hence, this study was carried out to assess the Oral Health-Related Quality of Life of preschool children in urban and rural, Bangalore.

## MATERIALS AND METHOD

A cross sectional epidemiological study was conducted in a representative sample of 3-5 year old preschool children visiting private and semi government schools of urban and rural Bangalore, Karnataka. Ethical clearance to conduct the study was obtained from institutional ethics review board. Initially, written permission was taken from the Block Education Officer, Department of primary education, Government of Karnataka, to carry out the study in schools. Further written consent was obtained from authorities of the individual schools.

Sample size was calculated according to formula:

$$n_1 = r+1 (Z_{\alpha/2} + Z_{1-\beta})^2 \hat{p}(1-\hat{p})$$

$r = d^2$

$n_2 = rn_1 = 3n_1$  where  $n_1$  = rural sample size;  $n_2$  = urban sample size

$\alpha = 0.05$  significance level and  $1-\beta = 0.9$  power of test.

$Z_{\alpha/2} = 1.96$  standard normal table

$Z_{1-\beta} = 1.28$  from standard normal table

$d = 0.12$  and  $(P_1 - P_2)$  is the effect size

A random sample of 1500 children from urban Bangalore and 500 children from rural Bangalore aged between 3- 5 years were selected. (ratio of children, aged 3-5 years, is 3:1 between Bangalore urban and Bangalore rural)

A proforma regarding Oral Health-Related Early Childhood Quality of Life (OH-ECQOL) was given to parent/caretaker of each child. It consisted of 12 items in the Child Impact Section(CIS) and 4 items in the Family Impact Section (FIS). Parent responses to each item were scored on a three-point scale to assess the frequency of an event occurring. Score for each was given as: Never = 1, Occasionally = 2, Often =3. Thus, the minimum score possible for each proforma was 16 and the maximum score possible was 48.

Parents of 455 children submitted incompletely filled proforma and were not included in the study. Therefore, the study group consisted of 1155 children in urban Bangalore and 390 children in rural Bangalore.

Oral examination of each child was done by a single trained, calibrated examiner with the child sitting in an upright position under good natural day light. Sterile mouth mirrors and Community Periodontal Index (CPI)-probes was used for examination of each child. Dental caries was recorded using WHO criteria.<sup>17</sup> Oral hygiene status was assessed using modified simplified oral hygiene (OHIS-M) index for primary dentition.<sup>18</sup> Surfaces of the primary teeth examined included buccal surfaces of the second upper and lingual surfaces of second lower primary molars, and labial surfaces of upper right and left lower primary central incisors. When any of these teeth were missing, a comparable adjacent molar or opposite central incisor was substituted. After the six tooth surfaces for each of the index were selected, scores were assigned, recorded and computed for oral debris index (DI-S) and calculus index (CI-S), respectively. The debris and calculus index scores were combined to obtain Simplified Oral Hygiene index (OHIS-M).<sup>18</sup>

Analysis of OH-ECQOL proforma :Parent responses to each item were scored on a three-point scale to assess the frequency of an event occurring. Score for each was given as: Never = 1, Occasionally = 2, Often =3.

Data obtained was tabulated and subjected to statistical analysis using non-parametric Mann-Witney U test, and Statistical Package for Social Sciences (SPSS) software version 23 (IBM Corporation, USA). The Mann Whitney U test was used to assess and compare the mean d, e, f and deft components between both groups. Independent Student t test was used to assess and compare the mean OHREC-QoL scores between urban and rural pre-school children in different age groups. Kruskal Wallis test followed by Mann Whitney's post hoc analysis was used to compare the mean deft scores between different ages in urban and rural pre-school children. One-way ANOVA was used to compare the mean OHREC-QoL scores between different ages in urban and rural pre-school children. Multiple logistic regression analysis done to assess OHRQoL and the variables using poisons regression.

## RESULTS

Tables 1a and 1b shows the responses of the parents/caretakers of both urban and rural preschool children to the items in the Family Impact and Child Impact sections of the proforma.

The mean OHRQoL of urban preschool children was 20.42 which was significantly different from the mean OHRQoL (17.86) of rural preschool children of Bangalore.( $p < 0.001$ ) (Table 2a) The mean OHRQoL of urban and rural preschool children was seen to increase from 3 to 5 years. At 3 years, the mean OHRQoL of urban and rural preschool children was 17.62 and 19.21, respectively; which was significantly different( $< 0.001$ ) The mean OHRQoL of urban preschool children was significantly lower (17.92) than that of the rural (20.90) preschool children at 4 years.( $p < 0.001$ ) At 5 years, the mean OHRQoL of urban preschool children was significantly lower (18.02) than that of the rural (21.17) preschool children( $p < 0.001$ ) (Table 2b)

Table 3 shows comparison of dental caries between urban and rural preschool children. The mean deft score was  $2.60 \pm 2.26$  in rural preschool children which was significantly higher than  $1.92 \pm 2.05$  seen in urban preschool children ( $p < 0.001$ ). The mean 'd' component was significantly higher in rural ( $2.50 \pm 2.23$ ) than in urban ( $1.43 \pm 1.74$ ). ( $p < 0.001$ ). A significantly higher number of

**Table 1a: Responses to items included in OH-ECQOL among urban preschool children**

Sl. no.	Impacts Child impact items	Never n(%)	Occasion-ally n(%)	Often n(%)
1.	Pain	744 (64.41)	144 (12.46)	267(23.11)
2.	Swelling	966 (83.63)	189 (16.36)	0 (0)
3.	Bad breath	1117 (96.70)	38 (3.29)	0 (0)
4.	Difficulty eating	1114 (96.45)	41 (3.54)	0 (0)
5.	Food caught between teeth	1124 (97.31)	31 (2.68)	0 (0)
6.	Difficulty cleaning teeth	1134 (98.18)	21 (1.81)	0 (0)
7.	Trouble sleeping	1134 (98.18)	21 (1.81)	0 (0)
8.	Irritable, crying	1134 (98.18)	21 (1.81)	0 (0)
9.	Fever	970 (83.98)	123 (10.64)	62 (5.36)
10.	Told by teachers or school authorities about bad teeth	1155 (100)	0 (0)	0 (0)
11.	Missed school	1086 (94.02)	48 (4.15)	21 (1.81)
<b>Family Impact Items</b>				
12.	Worried	790 (68.39)	219 (18.96)	146 (12.64)
13.	Missed work	1093 (94.63)	52 (4.50)	10 (0.86)
14.	Financial impact	1155 (100)	0 (0)	0 (0)
15.	Arguments amongst family members	1144 (99.04)	11 (0.95)	0 (0)

**Table 1b: Responses to items included in OH-ECQOL among rural preschool children**

Sl. no.	Impacts Child impact items	Never n(%)	Occasion-ally n(%)	Often n(%)
1	Pain	186 (47.69)	103 ( 26.41)	101( 25.89)
2	Swelling	308 ( 78.97)	40( 10.25)	42 ( 10.76)
3	Bad breath	256( 65.64)	134 ( 34.35)	0 ( 0)
4	Difficulty eating	251 ( 64.35)	139 ( 35.64)	0 ( 0)
5	Food caught between teeth	249 ( 63.84 )	141 ( 36.15)	0 ( 0)
6	Difficulty cleaning teeth	371 ( 95.12)	19 ( 4.87)	0 ( 0)
7	Trouble sleeping	313 ( 80.25)	77 ( 19.74)	0 ( 0)
8	Irritable, crying	303 ( 77.69)	87 ( 22.30)	0 ( 0)
9	Fever	280 ( 71.79)	103( 26.41)	7( 1.79)
10	Told by teachers or school authorities about bad teeth	390 ( 100)	0 (0)	0 ( 0)
11.	Missed school	347 ( 88.97)	30 ( 7.69)	13 (3.33)
<b>Family Impact Items</b>				
12	Worried	257 ( 65.89)	133 (34.10)	0(0)
13	Missed work	358 ( 91.79)	32 ( 8.20)	0 (0)
14	Financial impact	338 ( 86.66)	52 ( 13.33)	0 (0)
15	Arguments amongst family members	331 (84.87)	59 ( 15.12)	0 (0)

urban preschool children had filled teeth (0.44±0.93) as compared to 0.05±0.34 in rural preschoolers. (p<0.001).

A significant correlation was seen between dental caries (deft) and OHRQoL in urban preschool children (r=0.06, p=0.04). Their OHRQoL was significantly associated with the ‘decayed’ component.(p=0.03) (Table 4a) In rural preschoolers, there was an inverse relationship between OHRQoL and dental caries.(Table 4a) At 3 years, a significant correlation was found between OHRQoL and dental caries in only urban preschool children (p=0.03). At 4 years and 5 years, both urban and rural preschool children showed a weak correlation between OHRQoL and dental caries.(Table 4b)

Multiple regression analysis of OHRQoL and variables is given in Table 5. The Child Impact Section, had a significantly higher impact on children aged 5 years. (PR: 1.14; 95%CI: 0.84-1.22) (p<0.05). Rural preschool children showed a more significant impact with the OHRQoL in the Child Impact Section (PR: 0.90; 95%CI: 0.82-0.98) (p<0.05). Children with dental caries were more likely to be impacted by 1.70 times in the Child Impact Section (95% CI: 1.03-1.97) and 0.91 times in the Family Impact Section (95% CI: 0.67-1.15) which was significant (p<0.05). Overall, OHRQoL was significantly associated with the presence of dental caries (PR:1.21; 95% CI: 0.95-1.38) and particularly in children aged 5 years (PR:0.96; 95% CI: 0.71-1.05) (p<0.05).

**Table 2a: Comparison of OHRQoL between urban and rural preschool children**

OHRQoL		p value
Urban (N=1155) Mean±SD	Rural (N= 390) Mean±SD	
17.86±3.07	20.42±4.84	<0.001*

\*p<0.001 is highly significant

**Table 2b: Age-wise comparison of OHRQoL between urban and rural preschool children**

Age (years)	Urban (n=385) Mean±SD	Rural (n= 130) Mean±SD	p value
3 years	17.62±2.83	19.21±4.67	<0.001*
4 years	17.92±3.32	20.90±5.20	<0.001*
5 years	18.02±3.05	21.17±4.43	<0.001*

\*p<0.001 is highly significant

**Table 3: Comparison of dental caries between urban and rural preschool children.**

Dental caries	Urban (N=1155) Mean±SD	Rural (N=390) Mean±SD	p value
deft	1.92±2.05	2.60±2.26	<0.001*
d	1.43±1.74	2.50±2.23	<0.001*
e	0.06±0.26	0.04±0.24	0.20
f	0.44±0.93	0.05±0.34	<0.001*

\*p<0.001 is highly significant

**Table 4a: Correlation between dental caries status and OHRQoL among urban and rural preschool children**

Dental caries	Urban (N= 1155)		Rural (N= 390)	
	R	p value	r	p value
deft	0.06	0.04*	-0.01	0.79
d	0.06	0.03*	-0.01	0.89
e	0.05	0.10	-0.07	0.19
f	0.01	0.99	-0.04	0.49

\*p<0.001 is highly significant

**Table 4b : Correlation between dental caries status and OHRQoL at different ages in urban and rural preschool children**

Dental caries	OHRQoL											
	3 years				4 years				5 years			
	Urban		Rural		Urban		Rural		Urban		Rural	
	R	p value	r	p value	R	p value	r	p value	r	p value	r	p value
Deft	0.13	0.03*	-0.09	0.32	0.02	0.65	0.02	0.80	0.03	0.54	0.03	0.78

\*p<0.001 is highly significant

**Table 5: Multiple regression analysis of OHRQoL and variables**

Variables	Child Impact Section			Family Impact Section			Total Score				
	PR	95% CI	p value	PR	95% CI	p value	PR	95% CI	p value		
Unadjusted model											
Age (years)											
3 years	1										
4 years	0.89	0.80					0.89	0.80	0.98	0.02*	
5 years	1.14	0.84					1.02	0.79	1.10	0.04*	
Location											
Urban	1			1			1				
Rural	0.90	0.82		0.94	0.85	1.03	0.81	0.90	0.82	0.98	0.02*
Dental caries											
Absent	1			1			1				
Present	1.70	1.03		1.12	0.86	1.40	0.04	1.48	1.10	1.75	0.01*
Adjusted model											
Age (years)											
3 years	1										
4 years	0.89	0.80					0.74	0.48	0.96	0.07	
5 years	1.14	0.84					0.96	0.71	1.05	0.04*	
Location											
Urban	1										
Rural	0.90	0.82									
Dental caries											
Absent	1			1			1				
Present	1.70	1.03		0.91	0.67	1.15	0.03	1.21	0.95	1.38	0.01*

‡–Model adjusted for location

\* p<0.05 is statistically significant

## DISCUSSION

Oral Health-Related Quality of Life (OHRQoL) has been defined as an individual's perception of how functional, psychological and social aspects, together with pain and discomfort, affect personal well-being. OHRQoL can play an important role in understanding subjective evaluations.<sup>19</sup> The subjective evaluation of an individual in health care decision-making process, leads to a change in dynamics of clinical practice as they reflect a better understanding of treatment needs and outcomes from the patient's perspective.<sup>20,21</sup>

Indian population residing in rural India have diverse geographic, climate, cultural, ethnic and socioeconomic differences. Cultural beliefs and customs vary between families and communities.<sup>16</sup> Responsibility for the health of young children is usually borne by adults. Also, adults generally make decision about their children's health. Evidence from literature on child development and psychology indicates that children younger than 6 years of age are unable to precisely recall everyday and unique events beyond 24 hours. Children even begin to reason about timing of past events with respect to the day of the week, month or season at the age of 7 years and above.<sup>22</sup> Preschool children aged 3-5 years are unable to answer questions regarding their Oral Health-Related Quality of Life (OHRQoL).

Provisions of oral health-care services are few in rural parts of India where the majority of the Indian population resides. Disparities exist between the oral health status in urban and rural areas.<sup>23</sup> There are also differences in parental education and awareness regarding oral health. Families living in urban areas have better access to a range of amenities such as health facilities, educational institutions and easy transport services. There is a wide choice in selection of foods, particularly refined and 'ready-to-eat' food items. Most families living in urban areas are nuclear families, wherein both parents could be employed.<sup>24</sup> Child rearing practices in rural areas tend to be more influenced by socio-cultural beliefs.<sup>25</sup> In rural areas children grow up in the environment of a joint family, where there is an influence of grandparents and/or other family members on them.<sup>26</sup>

The items in the OH-ECQOL tool (proforma) used in our study consisted of descriptive domains of symptoms, function, emotional and social well-being in CIS and family well-being in the FIS. The 3-point scale regarding relevance of each item was used for recording as it allows easy understanding and scoring. A high overall score indicated a poor Oral Health Related Quality of Life. Another advantage of this tool is that it could be easily translated to a local language/ vernacular.

Preschool children in rural areas showed higher OHRQoL score compared to those in the urban areas of Bangalore. This indicated that the Quality of Life related to oral health was significantly better in urban preschool children. This difference was also evident at each age.

Interestingly, the OHRQoL score increased from 3 to 5 years in both urban and rural preschoolers. This is because with increasing age there is better language development in children, resulting in better communication with parents who are therefore, better able to perceive the difficulty of their child in relation to oral health.<sup>22</sup>

Once the children start attending preschool, there is a change in the dietary habits of preschool children.<sup>27</sup> Mothers predominantly of urban preschool children have a practice of providing snacks

in lunch boxes to consume during school break.<sup>28,29</sup> These snacks frequently contain soft textured food items such as noodles, fruit juices, bakery products and confectionaries.<sup>30</sup> Parents and grandparents frequently use sucrose rich products such as chocolates and candies to comfort a crying or cranky child. Sweets are often given as a reward or to bribe a child.<sup>31-33</sup>

In the OH-ECQOL tool, most of the items in Child Impact Scale (CIS), were related to the presence or absence of dental decay. In our study, the most frequently reported impact item by parents in the CIS was pain. Dental pain, especially in childhood can be a valid indicator to seek oral health care.<sup>34</sup> Toothache in primary dentition affects the physical status of the children as well as their psychological well-being and social interactions.<sup>35</sup> Cavitated lesions have been reported to be associated with OHRQoL among children and families due to the fact that parents/ caregivers recognize an oral health problem after it is manifested in the form of pain.<sup>36,37</sup> Although, dental pain affects eating and sleep which are essential for a child's development and overall health, it was not reported in the Child Impact Section (CIS) of the present study. This is in contrast to earlier Turkish<sup>38</sup> and Lithuanian<sup>39</sup> studies, wherein parents frequently reported 'difficulty in eating' and 'irritability' to be the impact items.

In this study, swelling was more often reported by parents of rural preschool children than parents of urban preschoolers. This could be due to parents not seeking dental treatment in time. Dental caries may have been left to progress resulting in further infection causing swelling and other factors, which are associated with pain or toothache. About 35% of rural parents reported of bad breath, difficulty in eating and food lodgement in their children, in contrast to only 3% of parents in urban areas. Lack of adequate knowledge and awareness amongst the parents in rural areas could be the reason for an increase in the frequency of these items.

Similarly, fever associated with dental decay was another consequence more frequently reported by parents of rural areas. School absenteeism was almost twice the percentage of urban preschool children who missed school. In urban areas higher percentage of parents seek dental treatment for their children before the development of signs and symptoms. Amongst the Family impact section (FIS), the item 'worried' was reported most often by parents of urban preschool children as they were more concerned. This was in accordance to earlier studies.<sup>40-42</sup>

In this study, financial impact was an item that affected OHRQoL of the preschool children only in the rural areas. Reasons given for this response included low family income and lack of accessibility and poor transport facilities to dental clinics situated far in the city. Arguments amongst family members' was selected by 15% of rural parents as a family impact item that affected the OHRQoL of their children. Differences in opinion could exist among family members on the need for dental care of their children. The prevalence of certain socio-cultural beliefs and practices within families could interfere and influence the parent's decision making, with regard to their child's dental treatment.<sup>12,13</sup> There is a long standing belief that dental health is separate from general health and should only be addressed when there is an evident problem.<sup>8</sup>

The Quality of Life(QoL) of rural preschool children was poorer than the urban preschool children probably because of significantly



higher proportion of dental caries in these children. The urban preschool children had received more dental treatment as indicated by the significantly higher proportion of filled teeth. In contrast, the treatment needs was higher in rural preschool children, who had significantly more untreated dental caries probably due to lack of interest in parents to take their children for dental treatment.

During the investigator's interaction with children living in rural areas, some of the mothers had expressed that their child would eventually lose their decayed primary tooth, (at times referred to as "milk tooth") and they did not find the necessity for treatment. Parents in rural areas did not appear to be perturbed about the presence of a decayed tooth in their child's mouth. Contrary to our findings and to that of Riedy et al,<sup>43</sup> Brazilian caregivers (mothers) were found to value primary or "milk teeth", which hold particular cultural significance for children's oral health.<sup>44</sup>

In urban preschool children, there is a significant association between the OHRQoL and dental caries status.<sup>45</sup> People residing in the urban areas have higher educational level and better standard of living, and therefore the responses given by these parents living in urban areas indicated that the presence of dental caries affected the quality of life of their children in a significant manner.<sup>45</sup> This was in contrast to the response given by parents of rural preschool children. Due to their lack of awareness on oral health, they did not consider dental caries to influence the Quality of Life of their children.

In the present study, most of the mothers in rural areas lacked any formal education or were school dropouts. The family income was mainly dependent on male members, who were engaged as agricultural labourers. Further studies relating socio-economic status with Oral Health-Related Quality of Life of preschool children need to be carried out. The results of this study could have been influenced by skewed distribution of dental clinics between urban and rural areas of Bangalore. Also, paediatric dentists may be lacking in rural areas.

The establishment of dental home at primary health centres in rural areas could have a beneficial effect in the promotion of oral health and thereby the Oral Health-Related Quality of Life (OHRQoL).

## CONCLUSION

1. The mean OHRQoL of urban preschool children was 17.86, which was significantly different from 20.42 in rural preschool children.( $p < 0.001$ ).
2. The mean deft score was  $2.60 \pm 2.26$  in rural preschool children and it was significantly higher than  $1.92 \pm 2.05$  seen in urban preschool children ( $p < 0.001$ ).
3. Oral Health Related Quality of Life was significantly associated with dental caries in urban preschool children.

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