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Impact of Early Childhood Caries on Quality of Life of Children and Their Parents: A Cross Sectional Study

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ABSTRACT

Introduction: Early Childhood Caries (ECC) is emerging as a public health issue and proper understanding of its impact on quality of life of children and their parents is required to be evaluated so that preventive and treatment protocols are devised. The aim of this cross sectional questionnaire based study was to assess the impact of ECC on QOL of Children and their parents.

Material and methods: This questionnaire based cross sectional study was conducted on (n=100) healthy children with clinically diagnosed ECC using DMFT index who attended dental outpatient department of our Institute during the year 2020-2022. Children diagnosed with ECC and their Parents were given separate pre tested & pre validated questionnaires. After completing the questionnaire appropriate statistical tests were applied and results were analysed.

Results: Children with ECC were divided on the basis of age into 4 age Groups. The results showed that as age increased the DMFT score also increased. Comparative Analysis of sleeping problems in children and ability of parents to concentrate on their work with child DMFT scores showed statistical significant results.

Conclusion: Within the limitations of our study it may be concluded that ECC impacts the quality of life of children as well as their parents. Most impacting parameter affecting the QOL in children was problem encountered during sleeping while their parents had concentration problems at work. Burden of ECC in children need to be evaluated through validated information retrieval models for assessing its impact on Child-Parents QOL so that early detection, prevention and interventions may be done.

Key words: Early Childhood Caries (ECC), Quality of Life (QOL), Cross Sectional Study

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INTRODUCTION

Dentofacial aesthetics and function is a determinant for overall well-being of a human being. In children it helps to psychologically build self-esteem and interpersonal relationships [1]. Dental caries is the most common chronic childhood dental disease which is 5 to 14 times more common than many allergies and chronic respiratory diseases like Asthma/Bronchitis [2]. The American College of Paediatric Dentistry has defined Early Childhood Caries (ECC) as presence of one or more decayed (Cavitated or non cavitated lesion), missing due to caries or filled primary tooth in children below 6 years (72 Months) of age. In children below 3 years of age any signs of smooth surface caries are an indication of Severe Early Childhood Caries (S-ECC) [3]. Davis in the Year 1976, argued that dental caries has only minimal effect on the Quality Of Life (QOL) in a person's life, but his concept was challenged by the work of Inglehart, Filtrup and Wandera in the year 2002 who demonstrated the consequence of oral disease in children [4,5]. The patho-physiological effects of ECC have long term negative and psychological effects on children. The consequences of ECC apart from causing immediate distress caused by tooth pain may involve risk of hospitalization and increased operatory visit for children. These further ads to the treatment cost and time, loss of school days, restricted activity and diminished cognitive learning [6-9]. A study by Clarke et al. found that children with severe ECC are more like to suffer from iron deficiency and reduced ideal body weight [10]. Ayhan in 1996 studied the effect of rampant caries on height, body weight and head circumference in children and found that rampant or nursing caries may correlate with adversely affected growth of the body [11]. The work of researchers in the past have evidently illustrated that ECC may have an impact on Quality of Life (QOL) of Children as well their parents and caregivers who may also be negatively affected by work hour loss and impacted by financial loss since they have to stay at home to provide care to children [12,13]. According to studies, developing

countries like China (53%) and India (53%) report greater caries prevalence than developed European countries (32% to 22%) [14]. ECC is emerging as a public health issue which requires urgent attention especially in developing countries like India and proper understanding of the impact of ECC on quality of life of young children and their parents is required to be studied and evaluated so that preventive and treatment protocols be devised and advised which may diminish the negative effect of ECC on overall health, if left untreated. Thus, with aforesaid objective in mind a cross sectional questionnaire based study was undertaken to assess the impact of ECC on QOL of Children and their parents.

MATERIALS AND METHODS

Study design and sample size: This questionnaire based cross sectional study was conducted on 100 healthy children with clinically diagnosed Early Childhood Caries (ECC) who attended dental outpatient Department of Gandhi Medical College and associated Hospital, Bhopal, M.P during the year 2020-2022.

Study sample size determination: A pilot study was conducted to assess the feasibility and to assess the prevalence of ECC in children below 71 months of age visiting our institute. Prevalence of ECC was found to be 45%. The prevalence in our study was found to be in conformity with the systematic review conducted by Ganesh A who found overall prevalence of ECC to be 49.6% in Indian population [15].

$$n = \frac{Z^2 * p * q}{d^2}$$

The sample size (n) was determined by using the following formula as depicted below:-

Z=Standardized Normal deviate (Z value)

p=Proportion or Prevalence of Interest (8%)

q=1-p (100-8=92)

d=clinically expected variation (10%)

Allowable error of 10% was taken. Keeping 95% confidence interval and 80% power of the study and 45% prevalence of ECC, the sample size was determined using the aforesaid formula as 96, which were rounded off to 100.

Inclusion criteria: Patients between 24 month to 71 months of age with clinically diagnosed ECC were included in the study.

Exclusion criteria:

- Patients less than 24 months of age or more than 72 months of age.
- Patient with no caries
- Medically compromised children for example: Children with Syndromes, underlying systemic diseases etc.

Methodology: After recording the patient's chief complaint according to the designed case history format, written informed consent was obtained from parents of children that their children information would be used in this study. A 9 point questionnaire instrument was developed based on literature review to assess the QOL of children covering social, psychological and physical impact of ECC. The questionnaire developed pertained to evaluating the impact of ECC on child's eating, sleeping, presence of pain and psycho-social behaviour. A 5 point questionnaire was simultaneously developed for the parents of children included in the study. Tables 1 and 2 illustrates the two modified Questionnaire's developed according to our loco-regional need which were adopted from the pre-tested and pre-validated Michigan Oral Health Related QOL Scale: Child and Parents Version. Bilingual validation of both the questionnaire provided to children and their parents was done by first formulating the questions in easy understandable language and then translating it into Hindi and again re-translating into English and checking again so that the meaning of sentences remained the same. Questions that appeared to be unclear were retranslated. Each parent was requested to sign both the questionnaires. Incomplete questionnaires were excluded from the study.

Table 1: Questionnaire for assessing the QOL of child and their responses.

S. no.	Questionnaire for the child	Total Count of YES*	Total Count of NO*
1	Do your teeth hurt you now?	72	28
2	Do your teeth hurt when you eat something hot or cold?	53	47
3	Do your teeth hurt when you eat something sweet?	63	37
4	Does a hurting tooth wake you up at night?	64	36
5	Does a hurting tooth stop you from playing?	31	69
6	Is it hard for you to chew or bite?	69	31

7	Do you like your teeth?	81	19
8	Are you happy with your teeth or smile?	78	22
9	Do kids make fun of your teeth?	56	44

* n and % are same in current study as the sample size is 100.

Table 2: Questionnaire for assessing the QOL of parents and their responses.

S. no.	Questionnaire for the parents	Total count of YES*	Total count of NO*
1	Do you have to take leave from work for the child?	44	56
2	Are you able to concentrate on your work?	35	65
3	Can you sleep through the night?	62	38
4	Do you have to take your child frequently to dentist?	47	53
5	Do you have to borrow money from somebody?	73	27

* N and % are same in current study as the sample size is 100.

All the dental examination was performed by single trained dentist. The clinical examination was performed on a dental chair under standard lightening conditions with sterilized mouth mirror and a Number 23 Dental Explorer. Caries experience was evaluated by DMFT index [16] as follows:

Formula for DMFT Index calculation:

DMFT=D+M+F

After recording caries and confirming the cases for ECC, older children and parents were given the questionnaires. In cases where the child was small their verbal/expressions were visualized and the questionnaire was completed by the parent. The results was analysed after completing the questionnaire.

Statistical analysis: The data obtained was subjected to statistical analysis with the consultation of a statistician. The data so obtained was compiled systematically using Microsoft Excel Spread Sheet. A master table was prepared and the total data was subdivided and distributed meaningfully and presented as individual tables.

Statistical procedures were carried out in 2 steps:

- Data compilation
- Statistical analysis
- Presentation

Statistical analysis was done using Epi Info Version 7.2 (Developed by CDC, Atlanta, Georgia, and USA). Data comparison was done by applying specific statistical tests to find out the statistical significance of the comparisons. Level of significance was fixed at $p<0.05$. Highly significant level was fixed at $p<0.01$. The children and parents response to questionnaire were categorized into Yes/No Response and single-item analyses was conducted using chi-square test.

RESULTS

In this cross sectional study the responses were recorded by questionnaire to assess the QOL of child with ECC and the overall responses were found to be 63% as YES and 37% as NO Table 1 depicts the total number of responses as YES/NO for each question. Further, in the Parents questionnaire, which assessed parents QOL, the overall responses recorded were 52.2% as YES and 47.8% as NO as illustrated in Table 2.

In the study sample size of 100 patients the Male to Female sex ratio was found to be 55% and 45% respectively. The Mean Age of Male Child was 51.6 months whereas the Mean Age of Female Child was 51.4 months.

Children with ECC were divided on the basis of age into 4 age Groups as depicted in Table 3. This Table also depicts the mean age in different age group along with the Mean DMFT and total number of children in each group. The Mean DMFT score was calculated to be 4.43. The Mean DMFT of Male Child was 4.2 whereas the Mean DMFT of Female Child was 4.

Table 3: Mean age and DMFT along with total number of children in different age groups.

Age Group	Age	Mean Age	Mean DMFT	Total Number of Children

1	24 to 35 months	30.41 months	2.94	17
2	36 to 47 months	41.82 months	3.68	22
3	48 to 59 months	53.44 months	4.64	25
4	60 to 71 months	66.11 months	5.44	36

Table 4 depicts that 17 children in Group 3 and 31 children in group 4 had DMFT score of greater than 3.5 signifying that as age increases the DMFT score also increases. The *chi-square* statistics was found to be 17.1428 with p–value of 0.000661 with statistically significant results at ($p<0.05$).

Table 4: Evaluation of DMFT Score at different Age Groups.

	Age group 1	Age group 2	Age group 3	Age group 4	Total
DMFT less than equal to 3.5	12	9	8	5	34
DMFT more than 3.5	5	13	17	31	66
Total	17	22	25	36	100

Table 5 demonstrate the eating problems and sleeping problems faced by children diagnosed with ECC as compared to their DMFT scores. In relation to eating problems faced by children and their DMFT scores No statistical significance was found with p-value to be 0.246311 at p<.05. However, the results were statistically significant with sleeping problems associated with dmft scores.

The P-value was found to be 0.000117 at $p<0.05$ (*Chi Square* Statistics: 14.842) signifying that as DMFT scores increase in children with ECC their problems during sleeping also increases. Further, No Statistical significance (*Chi-Square* Statistics: 1.6714, p-value 0.1960 at p<05) was found between psychological problems in Children compared to the DMFT.

Table 5: Eating, sleeping and psychological problems in children and their parents compared to the DMFT score.

IN CHILDREN			
1	**Problems during eating Present**	**Problems during eating Absent**	**TOTAL**
DMFT Less than equal to 3.5	26	8	34
DMFT More than 3.5	43	23	66
Total	69	31	**100**
2	**Problems during sleeping Present**	**Problems during sleeping Absent**	**Total**
DMFT less than equal to 3.5	13	21	34
DMFT more than 3.5	51	15	66
Total	64	36	**100**
3	**Psychological problems Present**	**Psychological problems Absent**	**Total**
DMFT less than equal to 3.5	16	18	34
DMFT more than 3.5	40	26	66
Total	56	44	**100**
IN PARENTS			
1	**Problems during sleeping Present**	**Problems during sleeping Absent**	**TOTAL**
DMFT less than equal to 3.5	14	20	34
DMFT more than 3.5	24	42	66
Total	38	62	**100**

2	**Concentration problems during work Present**	**Concentration problems during work Absent**	**Total**
DMFT less than equal to 3.5	14	20	34
DMFT more than 3.5	51	15	66
Total	65	35	**100**
3	**Effect on financial loss Present**	**Effect on financial loss Present**	**Total**
DMFT less than equal to 3.5	22	12	34
DMFT more than 3.5	51	15	66
Total	73	27	**100**

Similarly a comparative analysis of the sleeping problems, ability to concentrate on work and financial loss incurred to parents with the DMFT indices of their children with ECC was also undertaken. The results depicted that there was no statistical significance in Sleeping Problems (*Chi-Square* Statistics: 0.2206, p-value. 638566, p<05) faced by the parents and financial loss (*Chi-Square* Statistics: 1.798, p-value. 179955 and p<.05) incurred to them. However, statistical significance (*Chi-Square* Statistics: 12.8519, p-value. 000337 at p<.05) was found with higher DMFT scores and the ability of parents to concentrate on their work. Thus, evidencing that Parents of Children diagnosed with ECC with High DMFT score (<3.5) had problems in concentrating at work. Table 6 depicts percentage of problems encountered by both Children and their Parents in various Age Groups.

Table 6: Percentage of problems encountered by both children and their parents in various age groups.

Age Group	Problems during sleeping in child	Problems during eating in child	Psychological impact on child	Problems during sleeping in parents	Effects on expenditure in parents	Problems during work in parents
1	8 in 17 patients	9 in 17 patients	6 in 17 patients	6 in 17 patients	13 in 17 patients	11 in 17 patients
	-47.06%	-52.94%	-35.29%	-35.29%	-76.47%	-64.70%
2	14 in 22 patients	18 in 22 patients	9 in 22 patients	9 in 22 patients	16 in 22 patients	14 in 22 patients
	-63.63%	-81.80%	-40.90%	-40.90%	-72.72%	-63.63%
3	17 in 25 patients	17 in 25 patients	13 in 25 patients	10 in 25 patients	18 in 25 patients	17 in 25 patients
	-68%	-68%	-52%	-40%	-72%	-68%
4	25 in 36 patients	25 in 36 patients	28 in 36 patients	13 in 36 patients	26 in 36 patients	23 in 36 patients
	-69.44%	-69.44%	-77.77%	-36.11%	-72.22%	-63.89%
Total	64% Present	69% Present	56%	38% Present	73%	65% Present
			Present		Present	

DISCUSSION

Oral health problems are known to affect quality of life of child as well as of their parents [17]. This study was conducted to study the impact of ECC on QOL of Children and their Parents. Prior studies in this field have depicted that children only in the age group of 4 and 5 years of age or older are able to participate in such a questionnaire based study and provide data to the examiners related to their caries experience [1,18]. However, contrary to this finding our study recorded verbal/expressional responses from children as young as 24 months of age. This raises an important question that drives us to think to develop better communication skills with children in younger age groups as well so that their ECC related problems may be communicated not only to their care givers/parents but also to the doctors who will treat them. Further, our results are similar to the study conducted by Filstrup who recorded responses of children about their oral health as young as 36 months of age. Thus, developmental age rather than chronological age should be a key determinant for retrieval of information from a child for assessing child's need for preventive or interventional dental care [19]. Thus, our study provides an insight to develop a stronger instrument to measure the QOL of Children and their Parents.

In this study statistically significant results were seen in children with higher DMFT indices and their parent's inability to concentrate in their work. Our study also recorded higher DMFT indices in Age Group 3 and Age Group 4 depicting that as age increased the DMFT scores increased. Thus, the 5 point questionnaire provided to parents provided us with a valid measurement

instrument to alert the parents to assess the Childs need for dental care

Naidu in 2016 conducted a study on Oral Health Related Quality of Life amongst pre-school children in Trinidad and found that ECC is a public health issue which is globally affecting both developing and developed countries. In this study Early Childhood Oral Health Impact Scale (ECOHIS) was compared with many developed countries like Australia, Canada etc. and it was demonstrated that the most common impact of ECC on children were pain in teeth, pain due to hot and cold while eating some food and drinks and child being irritated. These findings were consistent with Table 6 of our study in which 69% children had problems like feeling pain during eating hot/cold/sweet, 56% Children had psychological problems and 64% children could not sleep during night due to pain [20,21].

Peker conducted a study of ECC Oral Health Impact Scale among 5-6 years old children in Turkish population and found that most common family impact in such age group children was financial loss and having to take time off work. In our study a statistically significant family impact found was the inability of parents to concentrate on their work in patients with DMFT greater than 3.5. Our study also showcases that higher DMFT indices (<3.5) were recorded in children between 48 months -71 months of age (*i.e.,* Group 3 and Group 4). Thus, evidencing the fact that QOL of parents is impacted in children with higher DMFT Index especially above 4 years of age [21].

Wendy Low et al. in the year 1999 conducted a study with an aim to study the effect of severe caries on the quality of life of young children. In this aforesaid study, information was collected from 77 children in the age group of 35 months -66 months with severe caries in their primary dentition. The study concluded that pre-school children may manifest pain by altering their sleeping habits. The results of this study are consistent with our study since 64% of the children diagnosed with ECC in our research suffered from sleeping problems. Statistically significant results were found when DMFT scores of children were compared with the sleeping problems encountered by them. Thus, signifying that as DMFT scores increase in children with ECC their problems during sleeping also increases [22].

Similarly in another study conducted by Sonu Acharya in 2011 on 500 children diagnosed with ECC the impact on sleep in children was found to be 44% and 15.6% in Group 1 and Group 2 respectively [23]. However, the impact on sleep was 35% in a study by Low [22] and 53% in a study by Filstrup [19]. In our study 64% children (Table 6) diagnosed with ECC had problems while sleeping.

The findings of our study highlight the need to develop and strengthen the oral health promotion strategy in our country for pre-school children which may go beyond escalating oral health knowledge. Parents and/or care givers should be provided practical advice and motivation to overcome barriers for preventive dental care. In this regard systematic reviews and meta-analysis research of Yevlahova and Borelli may be referred which demonstrates models for individual oral health promotion and their effectiveness and motivational interviewing for Parent-Child health interventions [24,25].

Limitations of the Study: This research could yield better representative results if the sample size was large. Our cross sectional study was done in an urban tertiary care hospital set up so; the findings may not be generalized for the local-regional rural population. Further, the study could have better results if QOL of Children with ECC and their Parents post dental treatment was also recorded and analysed. A post dental treatment follow up survey study may be conducted in future to investigate the impact of dental care on QOL of Children with ECC and their Parents.

CONCLUSION

Within the limitations of our study it may be concluded that ECC impacts the quality of life of children as well as their parents. Our study revealed that most impacting parameter affecting the QOL in children with ECC was children encountering problem during sleeping. Further, their parents had concentration problems at work. Moreover, these impacts were statistically significant in children above 4 years of age group with higher caries indices. Burden of ECC in children need to be evaluated through caries assessment tools, validated information retrieval models along with parents evaluation of their child oral health issues and assessing its impact on their QOL so that early detection, prevention and interventions may be done which may ultimately improve the QOL of children and their parents.

Ethical approval: The ethical approval was granted vide Letter No-852/MC/IEC/2020 dated 6/1/2020 from the Institutional Ethical Committee of Gandhi Medical College, Bhopal, M.P and India affiliated to Madhya Pradesh State Medical Science University, Jabalpur, M.P and India before commencement of study. Each study individual received a written informed consent form pertaining to the study drafted in accordance with the Helsinki Declaration of 1975 (Revised in 2000) and ensuring their confidentiality. They were also given the option of withdrawing from the study at any given point of time without assigning any reason. A translated consent form was then completed and signed by the parents of children upon agreement to participate.

CONFLICT OF INTEREST

All Author's Declare that there is no Conflict of Interest in the present study that could alter its outcome.

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