

## Dental Discomfort Questionnaire: correlated with clinical manifestations of advanced dental caries in young children

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### Abstract

**Introduction:** Pain is a complex and multidimensional phenomenon. The assessment of pain in children is a challenge for health care professionals, as their cognitive capacities are still underdeveloped, so indirect ways of assessing pain are of great importance.

**Aim and Objectives:** The present study was carried out to assess the correlation between the dental caries experience and Dental Discomfort Questionnaire (DDQ) in children aged between 2 to 5 years.

**Materials and Method:** The study sample consisted of sixty children, aged between 2 to 5 years. A self-structured questionnaire recording their demographic details and family structure, was given to the parents / guardians along with DDQ, which is to be filled in all aspects. Each child was examined for recording dental caries experience using the WHO criteria (1997) and advanced dental caries were assessed using the PUFA / pufa scale.

**Results:** The study revealed that all the sixty children suffered from dental caries but only fifty percent of them reported having toothache. The mean DDQ scores and DMFT scores were  $4.27 \pm 3.03$  and  $7.13 \pm 5.24$ , respectively. A statistically significant positive correlation was observed between the DDQ scores and dental caries ( $r = 0.40, p < 0.05$ ).

**Conclusion:** As children face difficulty in reporting the exact nature of dental pain, the DDQ seems to be an effective and functional instrument which can be used by the parents to recognize toothache in their children.

**Keywords:** Dental Discomfort Questionnaire (DDQ), PUFA / pufa, Dental Pain, Oral health related quality of life (OHRQoL).

### Introduction

Pain, an unpleasant sensation, has physiological, psychological as well as emotional components.<sup>(1)</sup> Due to the strong psychological and emotional basis, pain is perceived differently by different individuals. Furthermore, in young children who are cognitively immature, both pain perception and expression becomes ambiguous.<sup>(1,2)</sup> Pain evaluation, which is an important component of patient care, is strongly influenced by age, developmental status, cognitive and communication skills, past pain experience and cultural beliefs.<sup>(1)</sup> This demands age specific tools for pain assessment.

Although self-report measures are the gold-standard for pain assessment, they demand a certain level of cognitive and language development.<sup>(3)</sup> In order to overcome this drawback, observational (behavioral) pain assessment tools, which assess crying, facial expressions, body postures/movements etc have been developed.<sup>(4,5)</sup> These methods are flawed in that they are highly subjective, and clinicians may be unable to assess the vagaries of child's pain expression.<sup>(6)</sup> The next avenue that has been assessed is using a parent-proxy to evaluate pain. Research has shown that parents can offer clinically valid assessment of pain and distress in their children.<sup>(7,8)</sup>

Like any other acute/ chronic painful conditions, dental pain perception in young children is complex and very difficult to assess. Toothache can manifest in numerous ways influencing a child's behavior.<sup>(9)</sup> It is

these behavioral cues which may help parents and clinicians identify pain experience in young children. Based on the recognition of these behavioral effects of children in pain by parents/ guardians, the Dental Discomfort Questionnaire (DDQ) was developed. It has been shown to have good predictive value when assessing toothache in children (aged 2-4 years).<sup>(10,11)</sup>

Dental caries in children has been shown to adversely impact the oral health related quality of life (OHRQoL).<sup>(12)</sup> This undesirable effect on children's OHRQoL is usually a consequence of toothache which results from advanced odontogenic infections like, deep dentinal caries, pulpal involvement, abscess, etc.<sup>(13,14)</sup> These manifestations of untreated dental caries can be assessed by using the PUFA / pufa index.

Thus we planned the present study to assess the relationship between DDQ scores and the clinical consequences of untreated dental caries in children aged 2 to 5 years.

### Materials and Method

**Sample:** A study cohort consisting 60 children, between the age of 2 to 5 years and their parents were randomly selected from the patients reporting to the Department of Pedodontics and Preventive Dentistry, of the institute. The children were included in the study, if they fulfilled the following criterion:

1. Boys and girls in the age range of 2 to 5 years.
2. No associated systemic illness.
3. The children could be either verbal or preverbal.

4. The parents can understand spoken English or Hindi.
5. Parents, who were unaware of their child's dental caries status.

After the parents had understood the aim, methodology and risk/benefits of the study, their written consent was obtained for inclusion of their child in the study.

**Questionnaire:** The questionnaire was pretested prior to the start of the study to check for parental understanding and reproducibility and was completed by the parents in the presence of the investigator prior to the clinical examination of the child. It consisted of two parts; the first part included information regarding the parents socioeconomic status (SES) and the second part consisted Dental Discomfort Questionnaire (DDQ).<sup>(15)</sup>

The first portion of the DDQ questionnaire was concerned with the level of parent's awareness regarding their child suffering from toothache. The parents were questioned if he/ she ever noticed that the child suffered from toothache. This question could be answered by choosing one of the following options: "never", "sometimes", "often", and "I don't know."

The second portion of the questionnaire consisted of eight questions regarding different behaviors displayed by children affected with toothache or any dental discomfort. The questions could be answered on a 3-point scale: 0 "never", 1 "sometimes" and 2 "often". The sum of scores for the second portion of DDQ could thus range between 0-16.

**Oral examination:** The investigator was calibrated to carry out intraoral examination of children before the start of the study to evaluate both dental caries (WHO Index, 1997) as well as clinical manifestations of advanced dental caries (PUFA/pufa Index, 2010).<sup>(16,17)</sup> The intra examiner reliability was assessed by re-examining 10% of the sample population, and with a (Kappa score = 0.85) was observed.

The PUFA / pufa index was scored separately from the DMFT/dmft. The pufa scores the presence of visible pulpal involvement (p), ulceration of the oral mucosa (u), presence of a fistula (f) or abscess (a). The PUFA / pufa score per subject has calculated in a cumulative way similar to DMFT/dmft.

A CPI ball-ended probe was utilized for the dental caries examination as described by WHO.<sup>(17)</sup> Initial carious lesions could not be assessed. PUFA / Pufa scores were obtained visually without the use of any instruments.

**Statistical Methods:** All the data was analyzed using the SPSS 22.0 software package for statistical analysis. Descriptive statistics were applied to assess the mean dmft / dmfs, pufa and DDQ scores. The association between DDQ, dmft / dmfs and pufa was assessed using

Pearson's correlation coefficient. The statistical significance was set at < 0.05.

## Results

**Sample demographics:** The study cohort comprised of 60 children out of which 40 (66.7%) were males and 20 (33.3%) were females. The subjects were categorized into three age groups; 2-3 years (n=21), 3-4 years (n=14), 4-5 years (n=25).

The children included in the study came from varied socioeconomic backgrounds and were assessed using the Kuppuswamy's socioeconomic status (SES) scale.<sup>(18)</sup> The distribution of children according to their SES was as follows:-4 (6.7%), 35 (58.3%) and 35 (35%), from the lower, middle and upper SES, respectively.

**Dental findings:** All children included in the study were affected by dental caries. The mean DMFT / dmft ( $\pm$  SD) was found to be 7.13 ( $\pm$  5.24) and the mean dmfs ( $\pm$ SD) was 13.83 ( $\pm$  11.76). The overall prevalence of pufa scores in the cohort was 37(61%). Mean pufa ( $\pm$  SD) was found to be 2.18  $\pm$  2.82.

Out of the total sample, 30 (50%) children who had a dmft score >1 suffered from toothache, while 53 (88%) of the children who had positive pufa scores, had toothache. Parents of only 4 (6%) children who had a positive pufa scores reported that the child never suffered from a toothache, and 3 (5%) responded by saying that they did not know (Table 1).

**Table 1: Percentage of decayed teeth (dmft >1) and clinical manifestations of untreated dental caries (pufa >1) linked to reported prevalence of toothache**

	Toothache	No Toothache	I do not know	Total
dmft > 1	30 (50%)	21 (35%)	9(15%)	60(100%)
dmft = 0	0	0	0	0
pufa >1	53(88%)	4 (6%)	3(5%)	60(100%)

pufa assesses four different odontogenic infections, it is the pulpal component (p) which mostly contributed towards the pufa score (56.66%) followed by the presence of abscess (a) and ulceration (u) (15 % each) and lastly the presence of fistula (13.3%).

**Pain data:** After questioning the care givers about specific pain related behaviors (DDQ) the mean DDQ score ( $\pm$  SD) was found to be 4.27  $\pm$  3.03. When analyzing each of the eight behaviors for positive prediction of toothache, two of the eight behaviors were more frequently observed i.e. problems chewing and problem with brushing upper teeth (Table 2).

**Table 2: Percentage of children with or without toothache demonstrating specific behaviors on Dental Discomfort Questionnaire**

Behaviors from the DDQ ('sometimes' or 'often')	Children with decayed teeth and Toothache (n=30)	Children with decayed teeth without toothache (n=30)
Problems with brushing upper teeth	23 (76%)	2 (6%)
Puts away something nice to eat	20 (66%)	11 (37%)
Problems with brushing lower teeth	08 (26%)	1 (3%)
Bites with molars instead of front teeth	21 (70%)	13(43%)
Chewing at one side	19 (63%)	13 (43%)
Problems chewing	24 (80%)	10 (33%)
Reaching for the cheek while eating	18 (60%)	5 (17%)
Crying during meals	10 (33%)	7 (23%)
Proportion of children with a score 4 or higher on the DDQ	27(90%)	6(20%)

Our study found a positive correlation between the average DDQ score and the dmft/dmfs, as well as, pufa scores. A highly statistically significant correlation was noted between DDQ scores and the severity of dental caries assessed by using both dmfs and pufa index (Table 3). No significant association was observed with the family's socioeconomic status.

**Table 3: Correlation of DDQ score with mean dmft/dmfs, pufa scores and SES**

	Mean score	Pearson correlation	Sig. (p-value < 0.005)
DDQ	4.27 ± 3.03	-	-
dmft	7.13 ± 5.24	0.40	0.002*
dmfs	13.83 ± 11.76	0.51	0.00**
pufa	2.18 ± 2.82	0.53	0.00**
SES	22.18 ± 8.15	-.164	0.211

## Discussion

Pain experience is innately subjective and is influenced by the interaction of physiologic, psychologic, developmental and behavioral factors. Cognitive and emotional immaturities in young children (2-5 years) make it difficult for them to present with a reliable description of pain thus, toothache recognition is highly complex. It is important that we devise methods to identify pain experience in this age bracket in order to provide effective and timely treatment.

Considering a child's cognitive sequence of development various pain assessment tools were developed according to different age groups.<sup>(15)</sup> Since subjective reports of pain (e.g. visual analogue scale, Faces scale, etc.) in young children remain unreliable, thus observational pain-assessment tools were introduced for pre-school children to rate the intensity

of behavioral distress due to pain using behavioral cues, such as vocalizations, body movements, facial expression, etc.<sup>(2)</sup> Although clinicians may observe these changes, parents are in a better position to interpret their children's expression of pain, as they are aware of their child's disposition, temperament and daily activities. Parents can thus detect any changes in a child's behavior pattern resulting from a painful experience and thereafter interpret the degree of pain based on verbal communication.

Like other painful experiences, dental pain adversely affects a child's quality of life (QoL).<sup>(19)</sup> An imperative predictor for the onset of dental pain in children is presence of carious teeth. Filstrup et al, reported that young children with decayed teeth and toothache manifested behavioral changes in their eating/ sleeping habits and daily activities.<sup>(20)</sup> Likewise, Easton et al, in their study compared acute to chronic dental pain, and concluded that both influenced a child's QoL.<sup>(19)</sup> Since toothache affects the behavior pattern / QoL of a child, a parent proxy tool was developed namely, the Dental Discomfort Questionnaire (DDQ) (Versloot et al, 2006), to assess toothache in young children aged 2-5 years, where self-report scales cannot be utilized.<sup>(15)</sup> Extensive interviews with parents led to the formulation of the DDQ, which consists of eight questions related to specific behaviors presented by children when suffering from toothache.

In our study, of these eight behaviors, three were more commonly reported; Problems chewing, Problems with brushing upper teeth and Bites with molars instead of front teeth (Table 2). The reason may be that most children evaluated in our study had carious anterior teeth and thus were more likely to bite with their molars, and continue with this behavior after treatment because of the absence of the teeth. Another study found similar results showing problems brushing upper teeth and bites with molars.<sup>(21)</sup> A study carried out by Versloot et al, specifically identified the following behaviors to be more commonly reported: Pushes away something nice to eat, problems brushing upper or lower teeth, problems chewing and reaching for the cheek while eating.<sup>(15)</sup>

When assessing toothache using this parental questionnaire, we found that 50% of the children with decayed teeth suffered from toothache according to the parents (Table 1). This is in line with the 48% found in an earlier study where DDQ was used.<sup>(22)</sup> This finding may have resulted from the fact that the children without toothache were either suffering from initial/enamel or dentinal caries, or the parents failed to identify toothache in their child. Literature has shown it is not mere presence of untreated dentinal carious lesions in primary teeth which would be causative factor for toothache.

When evaluating the correlation between the DDQ score and various dental caries assessment parameters; we found a positive correlation with caries prevalence

(dmft), but a stronger positive correlation with caries severity (dmfs), as well as, clinical consequences of odontogenic infections (pufa score). These findings may result from the fact that greater the severity of dental caries, more likely is a child to display pain related behaviors, as supported by previous literature.<sup>(23)</sup>

The classical DMFT/dmft index only provides information on caries status and restorative aspects but fails to present an overview of the clinical consequences of untreated dental caries, such as pulp involvement, dental abscess, fistula, ulceration, etc. It is these parameters which possibly influence a child's QoL than the carious lesion itself.<sup>(24)</sup> It is for this reason that the PUFA/pufa scale was developed. The reason for the strong positive correlation between pufa and DDQ scores may be that toothache in children can be objectively assessed only when the carious lesion process reaches advanced stages of odontogenic infections. Other studies have also shown that a primary tooth with a positive pufa score is statistically more likely to be painful.<sup>(24)</sup>

Furthermore, we assessed the DDQ scores with the families SES. No significant correlation was found between the two. Unlike the findings of our study, Barrette et al (2009) in his study found toothache to be associated with poor SES.<sup>(25)</sup> The fact that our study did not find any correlation may be due to the reason that our sample size was small resulting in an uneven distribution with regard to the SES. A more extensive study with a larger population cohort should be planned to assess the influence of other factors, such as, SES, family structure, parental education level, etc. on the parental perception of dental pain experience in their child.

## Conclusion

Thus, we would like to conclude by saying that initial toothache in children may go unrecognized and the child's misery resulting from a carious tooth may extend gratuitously. It is thus important to train parents in identifying behavioral changes in their child to help predict and manage dental pain in young children. Additionally the pufa index should be used alongside current caries assessment tools, as it will provide a better determinant of child's oral health status and help plan hierarchical and robust oral health programs to meet treatment needs.

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