Dental Discomfort Questionnaire as an Assessment Tool in Detecting Early Childhood Caries

Muhammad Nasrun Akmal Rosli[1], Murshidah Abdul Ghani[1], Salwana Supaat[1], Azrul Fazwan Kharuddin[1], Yunita Dewi Ardini[1]*

1. Department of Pediatric Dentistry, Faculty of Dentistry, International Islamic University Malaysia, Pahang, Malaysia.

Abstract

Dental Discomfort Questionnaires (DDQ) is a set of toothache-related-behaviours questions designed by a group of paediatric dentist. This study aims to evaluate the relative dental discomfort among preschool children and to assess awareness of parents for toothache-related-behaviours in their children through DDQ. A cross-sectional study was conducted at IIUM Dental Clinic and Kuantan area involving preschool children 5 years old and below in the period of 10 months from February until November 2016. This research was approved by the IIUM Research Ethic Committee (IREC). Inter-examiner reliability was tested with Kappa statistic (0.83). Participants‟ caries status was assessed using decayed-missing-filled teeth (dmft) and self-administered DDQ is filled out by their parents/caregivers. Data entry and data analysis were done using SPSS and Amos® package version 23 with significance level set at $p<0.05$. 107 children were examined. Reliability score for behaviour section (DDQ-12) showed a high Cronbach‟s Alpha value of 0.721 while awareness section (DDQ-6) showed a moderate value of 0.326. According to model hypothesis, data showed a good structural equation modelling by goodness of fit between toothache and dmft mediated by behaviours (TLI: 0.674, CFI: 0.754, RMSEA: 0.116). Behaviours concerning putting away sweet things after tasting (21%), bites with molar instead of front teeth (19%) and problems with brushing lower teeth (16%) were frequently reported toothache behaviours by the parents/caregivers.

DDQ can act as a reliable tools in helping parents/caregivers and dentist in identifying toothache in young preschool children.

Clinical Article (J Int Dent Med Res 2018; 11: (1), pp. 143-148)

Keywords: Preschool children, toothache, Dental Discomfort Questionnaire.

Received date: 20 September 2017 **Accept date:** 25 October 2017

Introduction

Pain is a complex multidimensional phenomenon and the objective of assessment of children's pain constitutes a challenge for health professionals.[1] Different from adults who were able to demonstrate and verbalize the feeling of pain, children were unable to express their pain perception accordingly. In addition, variations in children's cognitive abilities affect how they perceive, understand, remember and report pain.[2] It is only with the increase of age and advancement of psycho-physiological concept that eventually makes children started to verbalize and understand why pain hurt and able to explain its value.

In dentistry, pain in children comes in different ways and it is usually presented during the later stage in which cavitation is already present. It is only after the treatment children were able to subsequently improve their oral condition. However, it is important to note that not all children will come and[3] Thus, the assessment of pain in pre verbal children, toddlers and pre-schooler children makes it difficult for those who are involved in pediatric dentistry.

In light of this problem, assessment of pain through a standardized instrument shows a great importance in dealing with proper preventive measures in pediatric patients. Therefore, it comes with high hope that the Dental Discomfort

Corresponding author:
Muhammad Nasrun Akmal Rosli
Department of Pediatric Dentistry, Faculty of Dentistry, International Islamic University Malaysia
Kuantan Campus, 25200 Kuantan,Pahang, Malaysia
E-mail: nasrun_akmal@yahoo.com.my

Questionnaire would act as an assessment tool in providing insight into the pain related behavioural aspects by parents or caregivers.

Methodology

Participants

A convenience sample of 107 children under 5 years old attending the nursery and kindergarten in Kuantan was taken. Participant underwent physical oral examination and caries status was assessed using the dmft. The participant does not have any physical or mental disabilities and cooperative toward the dental examination. The Ethical Committee International Islamic University of Malaysia approved the study and the parents of participants gave their consent.

Dental discomfort Questionnaire

Due to the participant age, parents were asked to fill out the Dental Discomfort Questionnaire (DDQ). DDQ was applied as an observational instrument tool in assessing the dental discomfort and/or pain in very young children. The DDQ is made of two parts. The first part is of the DDQ is related to the occurrences of the toothache. The respondents were first asked how often their child had a toothache.

Potential responses included “never", “sometimes", “often" and “I do not know". If s/he noticed that the child had a toothache, the respondent reported when this occurred, i.e., “during meals", during the day or during the night. The second part DDQ includes 12 items about different child behaviours that could be associated with toothache or dental discomfort, which are answered on a 3-point scale, as follows: 0 = never, 1 = sometimes, and 2 = often. The twelve items included in the complete version of the DDQ are as follows: 1. Bites with molars instead of front teeth; 2. Puts away something nice to eat; 3. Cries during meals; 4. Has problems with brushing lower teeth; 5. Has problems with brushing upper teeth; 6. Has earache during the day; 7. Has earache at night; 8. Has earache during eating; 9. Has problems chewing; 10. Chews on one side; 11. Reaches for the cheek while eating; and 12. Suddenly cries at night.

Examiner Reliability

Reliability (internal consistency) of the DDQ is assessed by using Cronbach’s Alpha. Chi-square test is conducted to compare samples with regard to the reported 12- different pain associated behaviour. A pilot test done yields the following result (Table 1).

Domain	Cronbach’s Alpha	N of items	Interpretation
Awareness	0.721	12	High
Behaviors	0.326	6	Moderate

Table 1. DDQ reliability

Calibration and interclass correlation (ICC)

During the pilot test, calibration was done among the students with the supervisor and the interclass correlation was checked. The ICC between supervisor and students for the dental assessment by using dmft value was 0.81 for student 1 and 0.89 for student 2. Both students then calibrated with each other in the same way and the ICC obtained was 0.83.

Data analysis

Data was analyzed and organized using software Statistical Package for Social Science (SPSS Graduate Pack 23.0; SPSS Inc, Chicago, IL) version 23.0.

1. Descriptive statistics
   SPSS 23.0 was used for the descriptive statistics and the correlation matrix. Analysis for the distribution of age and sex will presented using frequencies (n) and percentages (%).
2. Inferential statistics
   Structural equation modelling (AMOS 23.0) was used to analyse the relationships among demographic factors, behaviour items and severity of caries represented by decay-missing-filled teeth (dmft). While multiple regressions is usually used for analyzsing the relationships between observed variable and latent variable, structural equation modelling is used for examining the relationships among latent variables. Since the purpose of this study is examining the associations among the behaviours, awareness and severity of caries (dmft),

structural equation modelling is an appropriate method in this study.

Data significance is test data fixed significant level (p=0.05) to reduce the risk of error as suggested by Cohen & Cohen's (1975). Then, data were also analyzsed using the Pearson correlation to explain the direction and relationship magnitude of the investigated variables according to the coefficient value(s) to examine whether there is a significant relation among the variables. If a correlation coefficient is a positive value, it means that resulting relation is proportionate among given variables. However, if the correlation is a negative value, the relation among variables is inversely proportionate. Cronbach's alpha coefficient that was used had been classified in accordance with the reliability index.

Structural Equation Modelling (SEM)

Multiple criteria were used to interpret the Structural Regression model. In order to interpret the overall fit of the hypothesized Dental Discomfort Questionnaire Model to the data of the current study, several model fit indices were examined. These were chi-square, CFI, TLI, and RMSEA. In addition, parameter estimates were examined to interpret the effects on endogenous variables from other variables presumed to directly predict them. Next, the indirect and total effects were examined to interpret the effects on dependent variable (dmft) from other variables through indirect and all presumed ways, respectively. Lastly, squared multiple correlation coefficients were examined to investigate the amount of variance in each mediator that was explained by the model.

Ethics, consent and permissions

Ethical approval for the study was granted by IIUM Research Ethics Committee (IREC) on 22nd January 2016 (IREC 552). Permission for the selected preschools inclusion in the study was obtained from head teachers and written positive consent was requested from parents and caregivers for the oral examination.

In addition, information about the study was given to the parents to read. A written consent also needs to give to the parents. However, informed consent need to be obtained from the parents before they answered the questionnaires.

Results

Based on the data collected, of the total 107 subjects participated in this study, 55.1% comprised of males while another 44.9% comprised of females with age range from 2 to 5 years old (mean age: 3.92). From this study, 57.9% of children are presented with caries (mean dmft: 3.28). From the study conducted, the most reported behaviour noticed or seen by the parents towards their children indicative of toothache comes from behaviours concerning putting sweets after tasting it, biting with molars instead of front teeth and problems with brushing upper teeth (Figure 1).

Behaviors	Frequency (n=107)	(%)
Problems with brushing upper teeth	26	10
Putting away sweet things	43	19
Problems brushing lower teeth	28	11
Bites with molar instead of front teeth	20	8
Chewing at one side	17	7
Problems with chewing	18	7
Reaching for cheek while eating	39	16
Crying during meals	53	21

Table 2. Frequency and percentages for each behavior reported by parents/caregivers.

Conceptual framework

Basically, this research aims to study the relationship between awareness, behaviours and severity of caries represented by dmft value. In this proposed framework, behaviours (8 items) and awareness (12 items) have direct relationship towards severity of caries represented by dmft value.

Figure 1. Theoretically proposed framework.

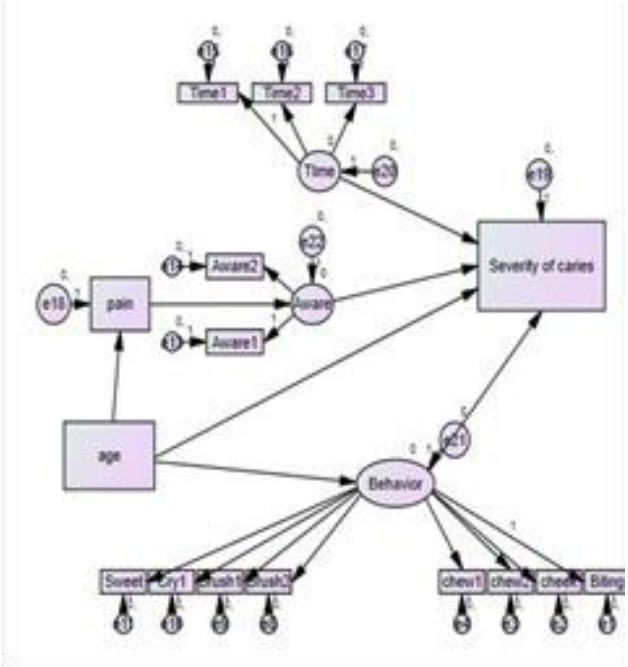

Figure 2. A draft model of independent variables (awareness, patient background), mediators (behaviours) and dependent variables (dmft).

Based on the conceptual framework (Figure 2), awareness and time did not give significant value to the analysis thus it were removed from the model framework (Figure 3).

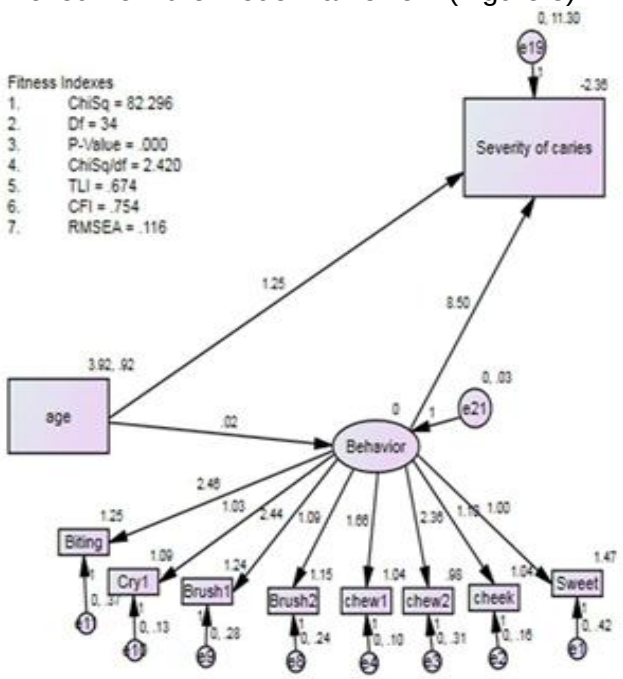

Figure 3. Pathway of structural equation model with significant relationship between behavior and severity of caries represented by dmft.

From the model hypothesis, a direct relationship is found between age and severity of caries (age ----> dmft) and behaviours towards severity of caries (behaviours ---> dmft). In summary, the p value of model hypothesis were shown in Table 3.

	Variables	Significant p value
Independent variables	age ----> dmft	0.000
	age ----> behaviours	0.310
	Biting on molars instead of front teeth	0.020
	Crying during meals	0.028
	Brushing upper teeth	0.018
	Brushing lower teeth	0.040
Mediators	Problems with chewing	0.017
	Chewing on one side	0.019
	Grabbing the cheek during eating	0.029
	Putting sweets away after eating	0.000

Table 3. Regression analysis.

Discussion

Based on the data collected, of all questions asked, four questions showed weakness in reliability, thus it have been removed and with these questions removed, DDQ-8 have a satisfactory reliability. The items that have been removed are cry2: crying at night, earache1: during eating, earache2: during day,

and earache3: during night time. Results from this study illustrates that certain behaviours showed the children aged 5 years and below can be an initial sign for parents that their children are actually experiencing toothache. Altogether, these findings give a preliminary validation for the questionnaires and show that we are better off with 8 items of questionnaires rather than the original total of 12 questions proposed by Versloot.[2] Through this study also, behaviour concerning biting with back teeth and putting sweet after eating are found to be more often presented in children with decayed teeth and toothache. This findings show correlation with the previous study that suggest eating and sleeping related behaviours have a significant link with children''s toothache.[2,4]

Pain is always a subjective experience, and the assessment is best done by using a self-report.[4] As such, pain assessment has been an important component for any evaluation of the index of treatment needed. When describing pain, it does not only involve the physical pain such as presence of wound or trauma, but it also includes the psychological pain as well as the patient perception towards defining and justify the value of pain. Hence, adult is proven to show better understanding toward pain compared to children due to a higher mental and cognitive function. Therefore, pain assessment for adult or older children is enough to be justified or evaluate most commonly through the verbal reports of grade 0-10.[1] However, the assessment has been difficult to attain in children due to poor cognitive abilities in interpreting pain and to justify its value. Their understanding of pain is hypothesized to follow a certain developmental stages like a normal physiological growth of body as the age advance.[5]

In dentistry, pain is usually associated with the presence of caries. Caries is defined as a biofilm (plaque)-induced acid demineralization of enamel or dentin mediated by saliva.[6] Early Childhood Caries is defined as the presence of 1 or more decayed (non-cavitated or cavitated lesions), missing (due to caries), or filled tooth surfaces in any primary tooth in a child 71 months of age or younger.[6] Dental caries experience at a young age is said to be predictive for caries development later in the permanent dentition.[7] An early recognition of toothache can be beneficial in preventive and restorative intervention before more teeth have been affected.

Treatment in children under 5 years old in pediatric dentistry can be a challenging experience for dental practitioner as children especially those under 5 years old are not cooperative due to lack of psychological or emotional maturity.[8] In addition, the pain itself can be difficult to be differentiated from anxiety which lead to a much more difficult assessment as children tend to perceive anxiety as a component of pain.[8] Therefore, assessment of pain through behavioural observation is of great importance. By applying the Dental Discomfort Questionnaire (DDQ), a reliable assessment of pain or dental discomfort in very young children can be achieved. Through a series of questions regarding the pain related behaviour that need to be answered by parents or caregivers, dental practitioners will be able to assess pain through several key points indicator in pre verbal children. Behaviours shown by children could form a checklist that would enable parents or caregivers in suspecting that their children are having toothache.[9,10] Apart from that, it can also contribute toward increasing awareness among the parents, teachers or caregivers regarding the impact of toothache toward the quality of life of children.[9,11]

From this parental report, 69.2% of parents do not know and never noticed that their children are in pain. As a result, this percentage reflects an underestimation of actual proportion of young children who suffer from tooth decay simply because their parents or caregivers are not aware of their toddler condition. Interestingly, out of 107 questionnaires delivered to the parents or caregivers, 29 of them left the questions regarding the awareness part empty. As a result, we were unable to find a good statistical correlation between the awareness of the parents or caregivers towards the toothache experienced by their toddlers. Toddlers with dental disease do not necessarily complaint of pain, most notably known for their lack of full understanding toward the concept of toothache.[5] However, they do manifest behavioural effect through changes in their eating and sleeping habits. A very great deal of young children depends on the behavioural cues rather than direct communication. Possibility of parents that actually may overlook this behaviour may greatly bring negative impact toward the childrens future management of deciduous dentition.[3] Thus, with this study, it shows that childrens behaviours

concerning biting on the back teeth rather on the front teeth and putting away sweet things after tasting it are predictive behaviour for the presence of toothache. These behaviours could possibly be used as cues by parents, caregivers or teachers to help them recognized toothache in young children.

Conclusion

In conclusion, the DDQ has shown to be a reliable instrument, which could be helpful in the future for parents, non-dental healthcare workers, dentists and researcher in identifying toothache in young children. It seems useful to take the child's behaviour into account in assessing toothache and to inform parents, and non-dental healthcare workers about which behaviours to look for so they can recognize when a child has toothache. As our sample is small and not representing Malaysia or Pahang specifically, caution should be taken when generalizing the result. However, it is worth to mention that the findings in this study can be add in literature and support for other instruments that can be of help for other research to be apply in clinical practice, in private office and in public service, to help with the diagnosis of a condition that affects the quality of life of children worldwide.

The limitation of this study is that our samples are actually small ones with low rates of feedback received from parents. Not all parents or caregivers give their full commitment in answering the questionnaires which lead to an imperfect result obtained. There was also an issue in which parents or caregivers reported about certain words or terms used cannot be understood by them. Should the research to be continued, a higher samples with greater area coverage should provide a more solid and fit result. Apart from that, the method of delivering questionnaires can also be changed in terms of making an interview in order to gain a better response or exact feedback needed from the parents or caregivers.

Acknowledgement

We would like to convey our thankfulness of these following people from the bottom of our heart for their contribution towards this study.

•The Pediatric Dentistry specialists, Asst. Prof. Dr Norzaiti Kenali, Asst. Prof. Dr Nor Asilah binti Harun and the staffs at CELPAD for helping us in the process of translation and validation of the questionnaire.

1. All nurseries and kindergartens for allowing us to conduct our research at their premises and giving their full cooperation.
2. All our participants and their guardians for agreeing to participate in this research and giving their full cooperation.
3. Fellow dental students from Year 4 and Year 5 for providing details of their patients to be approached as our research participants.
4. All the clinical staffs that have been involved in this research for their cooperation.

Declaration of Interest

The authors report no conflict of interest.

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