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Factors associated with dental behaviour management problems in children aged 2–8 years in Beijing, China

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Aim. This study determined the prevalence of children's dental behaviour management problems (BMP) in our clinic, investigated the influence of non-dental and dental background variables on BMP, and analysed the predictive power of these variables.

Design. The study group included 209 children aged 2–8 years who received dental treatment. Interviews were conducted with accompanying guardians. Children's dental behaviour was rated by a modified Venham's clinical anxiety scale and a cooperative behaviour rating scale. Regression models were used to analyse behavioural and interview data and to calculate the power of background variables to predict children's dental behaviour.

Results. During the first treatment, 29.7% of children displayed BMP. Four variables were found to predict BMP in 87.9% of cases. The risk factors for BMP were younger age, negative guardian expectations of the child's behaviour during treatment, anxiety or shyness around strangers, and presence of toothache. Children aged 2.5–3.5 years who attended kindergarten showed better dental behaviour than those who did not.

Conclusions. This study is the first to report BMP prevalence in mainland China. Our results indicate that a simple pre-treatment interview could provide data allowing the dentist to identify children with special dental behavioural needs.

Introduction

One of the most challenging problems faced by paediatric dentists is behaviour management. Since paediatric dentistry in China is a relatively new specialty with few practitioners, most paediatric dentists struggle to treat a large number of patients[1]. A 2003 survey of the behaviour management practices of 139 paediatric dentists in mainland China found that 44.6% had to terminate or change treatment plans in a 1-month period due to difficulties in managing children's behaviour[2].

Children's dental anxiety and/or dental behaviour management problems (BMP) are associated with many factors of both internal and external origins. Dental anxiety of external origin has been described as a simple conditioned phobia emerging from direct or indirect negative dental experiences[3–6]. Dental anxiety of internal origin, also characterised as a personality trait or endogenous anxiety[4,7,8], includes factors related to the person rather than directly associated with dental care. The dentist's behaviour is another factor associated with children's dental behaviour[9]. Studies have shown that the first dental visit is an important variable in the subsequent development of children's attitudes or beliefs about dentists and dental treatment. A positive dentist-patient relationship can have a positive effect on the patient's satisfaction, compliance, and use of oral health care services, as well as on home care and oral health[10,11]. An unpleasant first visit, however, may negatively influence further treatment and/or lead to dental anxiety[3,5,12]. Negative childhood experiences thus play a key role in the development of dental anxiety in adults[3,6].

The clinical paediatric dentist must be capable of effectively managing a child's behaviour. Failure to manage a disruptive child can place the child, dentist, and staff at risk, and

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may compromise the quality and efficiency of dental care. Fortunately, a dentist can employ several procedures to manage behavioural problems[13,14]. It is necessary to effectively predict children's dental behaviour (especially in a busy clinic), identify children at risk of BMP before such problems arise, and develop an appropriate management strategy during the first dental visit. Such a reliable predictive approach would provide an important contribution to paediatric dentistry[15].

Many studies have focused on children's dental anxiety rather than on their behaviour, using four main methods of measurement: psychometric scales such as the Dental Subscale of Children's Fear Survey Schedule[16] and children's temperament[17,18]; physiological techniques; behavioural ratings such as the Frankl scale[19]; and projective techniques such as the Children's Dental Fear Picture Test[20]. These methods are not specifically oriented to BMP, are lengthy, and/or require special training or equipment. Few studies have focused on predicting children's behaviour in the dental clinic.

Some significant predictive variables for behaviour have been identified, and these have proven valuable for paediatric dentistry. Predictors of BMP include age[21], parent's expectation of a negative reaction from the child in the dental situation, and the child's anxiety when meeting unfamiliar people[22]. Such studies, however, have been conducted with small sample groups[21,23], limited age ranges[21], or in specialised paediatric dental clinics[15,24] serving patients with a limited range of social backgrounds and dental experiences. These factors make it difficult to draw generalised conclusions for the prediction of children's dental behaviour.

No systematic evaluations of children's dental behaviour in mainland China have been conducted to date. Accordingly, the main aims of this study were to determine the prevalence of children's BMP in our clinic, to investigate the influence of dental and non-dental variables on BMP, and to facilitate the effective prediction of BMP. We also sought to identify the factors related to dental behavioural changes reflected in subsequent dental visits. We hope that the results of this study will contribute to undergraduate education, postgraduate training in paediatric dentistry, and oral health policy in mainland China and other developing areas.

Material and methods

Participants and procedures

This study included 209 children (91 female, 118 male) aged 2–8 years (mean age = 4.9 ± 1.67 years) (Table 1). A convenience sample of children was selected from patients treated from June to August 2004 at the Department of Paediatric Dentistry, Peking University School and Hospital of Stomatology.

The selection criteria were: (1) the child needed dental treatment(s), including filling, tooth extraction, pulp therapy, pit and fissure sealant, and/or topical fluoride; (2) the child was aged 2–8 years; (3) the accompanying guardian was one of the child's primary caretakers; (4) the primary and native language of the guardian was Mandarin; (5) the child had no easily discernable mental limitations or communicative disorders; (6) the dentist had no previous connection with the child or guardian, (i.e., this was the child's first visit to the examining dentist); and (7) the accompanying guardian was able to understand and reply to our questions. Children with dental emergencies such as trauma, acute pulpitis, and acute periapical periodontitis were excluded. There were no gender-based, racial, or ethnic restrictions on participation.

Upon arrival at the clinic, a receptionist interviewed each child's accompanying guardian. The guardians were informed of the aims of this research, and could choose whether to take part in the study without affecting the dental care provided to the child. Written informed consent was obtained from all participants. The Human Research Ethical Committee of Peking University Medical Science Centre, Beijing, China approved this study.

Interview

A receptionist elicited each child's background variables from the accompanying guardian using a standardised questionnaire. The ques-

tionnaire consisted of 24 questions, 15 of which presented 3–5 semantically scaled alternative answers and 9 of which offered dichotomised answers (yes or no). The questions covered the child's personality factors, previous dental and medical treatment experience, health status, environmental conditions within and outside the family, and the guardian's attitude toward and experience with dental treatment.

Clinical treatment

The first author carried out all treatments, during which he used conventional behaviour management techniques (excepting sedation and general anaesthesia) according to the child's circumstances and any previously established behavioural management strategy. These techniques included communicative management, nonverbal communication, positive reinforcement, tell-show-do, and medical immobilisation with a papoose board. The guardian could be present or absent during treatments unless his/her presence obviously disturbed the child's behaviour.

Each child's dental treatment was videotaped with a fixed digital video (DV) recorder focused on the child and dentist. The entire DV record of each treatment was observed, and the child's behaviour was scored. A total of 363 treatments of 209 children were completed and videotaped.

The treatments were classified into three levels of invasiveness: non-invasive (e.g., topical fluoride application); moderately invasive (e.g., pit and fissure sealant, preventive resin restoration); and highly invasive, including any treatment requiring local anaesthesia such as deep caries restoration or tooth extraction.

Assessment of children's behaviour

Our previous study[25] translated Venham's clinic anxiety rating scale (VCARS) and cooperative behaviour rating scale (VCBRS) into Chinese and modified them for children aged 2–8 years according to the child's cooperative level during treatment, this scale were independently back-translated from Chinese to English and collated with the originals. The clinical practicality and sensitivity of these scales have been demonstrated in Venham *et al.*'s clinical evaluation of children's dental behaviour[26–28]. Each child's behaviour during the entire treatment session was rated on a 6-point scale, ranging from 0 (relaxed) to 5 (out of contact). The reliability of this scale was tested by asking 11 paediatric dentists and assistants to assess children's behaviour using a stratified random sample of 24 DV records (four records from each behaviour scale). The inter- and intra-rater reliability of the modified Venham's scale after 4 weeks were found to be 0.929 and 0.963, respectively.

All authors discussed the modified Venham's scale used in this study and received extensive training with DV records not included in the study. Inter-examiner agreement was then assessed as above using 24 DV records not included in this study, and exact agreement was found in 91.7% of cases. All DV records in this study were then independently scored by the second and the third authors using the modified Venham's scale. Neither scorer knew the information obtained in interviews or had previous contact with the children or guardians. The agreement of scores was then checked. In case of disagreement, the final score was determined by joint decision of the three authors. A score was then produced for each treatment. Ratings of 0–2 indicated acceptable behaviour that did not disturb the continuity of treatment. Ratings of 3–5 denoted BMP that interrupted the continuity of treatment.

Statistical methods

All interview and DV record data were analysed using SPSS 10.0 software. A multivariate logistic regression model was used to predict the binary response variable (acceptable behaviour or BMP) for the first treatment from the interview questionnaire data (predictor variables; $P < 0.10$).

The independent factors included all related factors published in previous studies[15,21,22] and some additional factors. Non-dental factors included: age, gender, kindergarten or primary school attendance, education level of mother, general health status, hospitalisation,

and anxiety or shyness around strangers. Oral health status factors included: presence of toothache or trauma, child's hostility to medical practitioners, guardian's expectation of child's behaviour at the dental clinic, guardian's dental experiences, guardian's dental anxiety, guardian's assessment of the child's medical experience, guardian's explanation of dental treatment to the child, whether guardian had promised to reward the child for good behaviour during dental treatment, and degree of treatment invasiveness. Interview responses were analysed to identify variables with sufficient power to predict the risk of the child's negative behaviour in the dental situation. Data from 199 children were included in the analysis; 10 children whose questionnaires had missing items were excluded, which did not affect age and gender distributions.

A linear regression model was also used to examine factors related to changes in children's dental behaviour. The dependent factor was behavioural change between the first and second treatments; independent factors included those used above and the difference in the degree of invasiveness between the first and second treatments. Regression was performed on the data from 94 children with complete questionnaires.

Mann-Whitney U tests were used to examine the relationship between dental behaviour at the first treatment and school attendance. Children aged 2.5–3.5 years were analysed according to enrolment in kindergarten, and children aged 6.5–7.5 years according to primary school attendance. Pearson's chi-square tests were used to assess differences in the accuracy of guardians' expectations of children with and without previous dental experience, the prevalence of toothache in children with and without previous dental treatment, and children's dental behaviour with and without guardians' presence.

Results

Participant characteristics

One hundred and ninety-eight (94.7%) of the 209 children in our sample were inhabitants of urban Beijing, and 100 (47.8%) lacked previous dental experience. The majority 182/209 (87.1%) of accompanying guardians were parents, and 24 (11.5%) were grandparents. Most (184/209, 88.0%) of the children's mothers had completed high school. While 126 (60.3%) guardians expected positive dental behaviour from their children, 55 (26.3%) expected negative behaviour, and 28 (13.4%) held no specific expectations. Before the dental visit, 108 of 207 (52.2%) of children had suffered toothache; this was the second-most common reason (53/204, 26.0%) for the dental visit. Caries was the primary reason (81/204, 39.7%) that children presented at the clinic. More than one-third (78/208, 37.5%) of children were anxious or shy around strangers. Twelve treatments (5.7%) were non-invasive, 69 (33.0%) were moderately invasive, and 128 (61.3%) were highly invasive. The mean length of the DV recordings was 28.2 minutes (range = 10–56 min, standard deviation = 12.6 min).

Children's dental behaviour

Children's dental behaviour during the first treatment was classified according to a 6-point scale (Table 1). More children (70.3%) showed acceptable dental behaviour than BMP (29.7%). Table 2 shows the relationship between age and dental behaviour during all treatments; 73.8% of children showed acceptable dental behaviour and 26.2% showed BMP.

Predictors of children's dental behaviour

Logistic regression analysis showed differences in background variables between children with acceptable dental behaviour and those exhibiting BMP during the first dental treatment. Four variables were found to be significant predictors of behaviour: child's age, guardian's expectation of the child's behaviour at the dental clinic, presence or absence of anxiety or shyness around strangers, and presence or absence of toothache (Table 3). BMP during dental treatment was associated with a child's younger age, negative guardian expectations, presence of anxiety or shyness around strangers, and/or presence of toothache. No other

Table 1. The relationship between age (years) and dental behaviour during first treatment.

	2–3	3–4	4–5	5–6	6–7	7–8	% (*N*)
0 (Relaxed)	1	8	17	16	25	24	43.5 (91)
1 (Uneasy)	2	11	9	8	6	10	22.0 (46)
2 (Tense)	1	3	2	2	2	0	4.8 (10)
3 (Reluctant)	0	2	0	4	1	0	3.3 (7)
4 (Interfering)	1	0	2	2	0	0	2.4 (5)
5 (Out of contact)	29	12	5	1	3	0	23.9 (50)
Total	34	36	35	33	37	34	100 (209)

Table 2. The relationship between age (years) and dental behaviour during all treatments.

	2–3	3–4	4–5	5–6	6–7	7–8	% (*N*)
0 (Relaxed)	2	24	26	27	34	38	41.5 (151)
1 (Uneasy)	5	20	21	23	8	16	25.6 (93)
2 (Tense)	2	5	7	7	3	0	6.6 (24)
3 (Reluctant)	1	4	3	4	1	0	3.6 (13)
4 (Interfering)	3	0	2	2	0	0	1.9 (7)
5 (Out of contact)	40	26	5	1	3	0	20.7 (75)
Total	53	79	64	64	49	54	100 (363)

factors significantly predicted children's behaviour in a dental situation. The total percentage of correctly classified children was 87.9%. Based on the results, we drew a regression equation: logitP = −0.884a + 1.212b + 1.063c + 0.918d + 0.955 (a: age; b: guardian's expectation; c: anxiety or shyness around strangers; d: presence or absence of toothache).

Behavioural changes between dental visits

Differences in dental behaviour between the first and second treatments were evaluated for 97 children. No behavioural changes were observed in 61 children; the behaviour of 29 children improved, and that of 7 children worsened during the second treatment. The degree of difference on the behavioural scale ranged from −4 to 5, with positive values indicating better behaviour and negative values indicating worse behaviour. This analysis sought to identify factors related to behavioural differences between the first and second dental treatments. Four statistically significant variables were found: child's age, child's behaviour rating for the first dental treatment, guardian's expectations, and presence or absence of conflict between the child and medical personnel (Table 4). The first three factors were positively related to the child's dental behaviour, while conflict with medical personnel was negatively related.

Table 3. Variables found to predict children at risk of BMP during the first treatment.

	B	Wald	Sig	OR	CI for OR
Age	−0.884	18.656	<0.001	0.413	0.319–0.666
Guardian's expectation	1.212	16.651	<0.001	3.360	1.877–7.706
Anxiety around strangers	1.063	4.523	0.033	2.894	1.087–7.706
Toothache	0.918	0.509	0.071	2.505	0.924–6.790
Constant	0.955	0.998	0.318	2.599	

B, regression coefficient; Sig., significant correlation *P*; OR, odds ratio; CI, 95% confidence intervals.

Table 4. Variables found to be related to behavioural change between the first and second dental treatments.

	Unstandardised coefficients		Standardised coefficients		
	B	SD	Beta	*t*	Sig.
Behaviour rating at first treatment	0.446	0.088	0.634	5.027	<0.001
Age	0.359	0.098	0.373	3.641	<0.001
Guardian's expectation	0.427	0.205	0.270	2.081	0.04
Conflict with medical personnel	−0.507	0.178	−0.304	−2.845	0.006
Constant	−2.618	0.582		−3.727	<0.001

B, regression coefficient; SD, standard deviation; Sig., significant correlation *P*.

Relationship between dental behaviour and school attendance

The variable of kindergarten attendance was examined by a Mann-Whitney U test on a subsample of 34 children in the 2.5–3.5-year age range. This variable produced significant differences in dental behaviour during the first treatment ($P = 0.019$). In contrast, primary school attendance was not correlated with significant differences in behaviour among 46 children aged 6.5–7.5 years ($P = 0.353$).

Guardian's expectations and children's previous dental experience

A Pearson chi-square test was used to analyse the variables of guardian's expectations and

child's previous dental experience for 208 children. A significant difference in the guardian's expectations was found between children with and without previous dental experience ($P = 0.01$). For children without previous dental experience, 75.5% of guardians correctly predicted their child's BMP, whereas 89.1% of guardians correctly predicted the BMP of children with previous dental experience.

Relationship between toothache and previous dental experience

A significant difference was also found in a sample of 207 children between the presence of toothache and previous dental experience. Among 108 children with previous dental experience, 61% suffered from toothache; only 42% of children with no dental experience ($n = 99$) suffered from toothache ($P = 0.007$).

Relationship between dental behaviour and guardian's presence

No significant difference in dental behaviour was found to relate to the presence or absence of guardians. Among 69 children who received treatment without the guardian's presence, 18 (26.1%) showed BMP; 50 of 140 children (35.7%) showed BMP with the guardian's presence ($P > 0.05$).

Discussion

This study offers a perspective on children's dental behaviour in mainland China, and has determined several dental and non-dental variables affecting children's dental behaviour. Our results indicate that it is possible to predictively identify children at risk of BMP.

In this study, we sorted children's behaviour into two types (acceptable and BMP) based on the continuity of undisturbed treatment. This binary categorisation is more practical for application in a busy dental clinic than an assessment based on Venham's 6-point scale. Logistic regression analysis identified four variables that could successfully predict BMP in our clinic. Children were correctly classified in 87.9% cases, which indicates satisfactory predictive value. We have demonstrated that a simple pre-treatment interview with the child's guardian is valuable in planning a child's dental treatment, and that guardians are able to predict the child's ability to cope with a dental situation, especially when the child has had previous dental experience.

The child's age, the guardian's expectation of the child's behaviour, and the absence of anxiety or shyness around strangers have also been identified as significant predictive factors by studies conducted in Western countries[15,21,22]. These three factors thus reliably predict children's dental behaviour in a variety of cultural groups. We additionally identified the presence of toothache as a risk factor for BMP. In this study, 52.2% of children had ever experienced toothache, and 26.0% of children presented for the first dental treatment because of toothache. The Dental Fear Survey Schedule (DFSS) ranking for children in mainland China (Kunming, Yunnan province) was found to be higher than that of Chinese children residing in Canada[29]. Although the difference was mainly explained by the younger ages of the Chinese children, most mainland Chinese parents in the study also reported that their children had received painful emergency treatment.

Versloot *et al.*[30] reported that the memory of previous dental experiences and earlier treatment sessions greatly influenced children's behaviour and experience during subsequent treatment sessions. Painful emergency treatments and those requiring the injection of local anaesthesia appeared to worsen children's subsequent dental behaviour. In our study, the presence of toothache was reported by a guardian, which may have introduced inaccuracy because the early symptoms of children, especially younger children, are often overlooked. The Dental Discomfort Questionnaire (DDQ) is a useful instrument for assessing young children's toothache[31]. Further studies using such an instrument are needed to more fully explore the relation between toothache and/or local anaesthesia injection and BMP.

According to Chinese tradition, public oral health services have been generally oriented toward curative care, and toothache has been the main reason for seeking dental treatment. A close relationship between dental anxiety and irregular attendance was also found among 5-year-olds in England[32]. Our results are similar, but derive from a different approach. In our opinion, systematic implementation of preventive oral care and community-oriented health programmes for children, especially preschool-aged children, are urgently needed in China. These measures can improve not only children's oral health status, but also their dental behaviour.

We feel that kindergarten experience has a great effect on children's dental behaviour: BMP tend to vanish when a child attends kindergarten, as confirmed by the results of this study. These results may have been affected by the 'one-child-per-couple' policy in mainland China; most urban children in this study had no siblings, and first interacted with non-family members in kindergarten. Tao *et al.*[33] conducted a longitudinal study of children without siblings in Nanjing, China, and found that they exhibited significantly more timidity, temper outbursts, obstinacy and disrespect of elders than children with siblings. Children learn social skills in kindergarten that include coping with strange persons and situations, and abiding by rules. We found these skills to be contributing factors in a child's dental behaviour. Further studies are necessary to explore these relationships.

Rud & Kisling[34] stated that chronological age does not always correspond to level of mental development. The results of this study support this opinion, since young age is just one significant predictor for BMP. Four children older than 6 years showed BMP, while three children under 3 years of age showed relaxed (scale 0) or uneasy (scale 1) behaviour during dental treatment. Age is therefore one of several predictors for children's dental behaviour.

Only 7.2% of children in this study behaved worse during the second dental treatment, and conflict with medical personnel was the only significant negative independent variable. Conflict with medical personnel was considered to derive from the behaviouristic-exogenous perspective wherein medical personnel were usually associated with uneasy experience, and from the psychoanalytic-endogenous perspective wherein medical personnel were regarded as a stranger by the child. Unless strictly understood, both models should be taken into consideration when interpreting the interaction between endogenous and exogenous factors. A medical or dental treatment is often associated with pain and/or discomfort, the discomfort is aggrandised by some parents or popular literature, and injection can sometimes be treated as an instrument of punishment or intimidation. Much work is therefore needed to change these sociocultural background factors, not only by medical and dental personnel but also by parents and the media.

Neither logistic nor linear regression analyses found a relationship between invasiveness of dental treatment and the dependent variable, which contrasts with popular opinion that pain and/or discomfort during dental treatment is the main reason for BMP. Ten *et al.*[35] stated that within the (direct) conditioning pathway, objective dental experiences seemed to play a minor role in children's fear acquisition, while subjective dental experiences may have played a more decisive role. They found that the number of fillings did not predict dental fear, and the number of extractions was only weakly predictive. Further studies are therefore needed to clarify the relationship between invasiveness of dental treatment and children's dental behaviour. The subjective experiences of children during dental treatment may be the most important factor.

We found that 29.7% of children displayed BMP at the first dental treatment, and 26.2% displayed BMP in a total of 363 treatments. These results are similar to those of a survey[36] of 160 members of the American Academy of Paediatric Dentistry, which indicated that 22% of children seen by those paediatric dentists showed marked BMP. These findings are alarming, given that more than one in four of all children under 8 years old in our clinic presented marked BMP. In mainland China, less than 5% (6/139) of paediatric dentists

use sedation or general anaesthesia in their daily dental practices[2]. These methods are effective and safe treatments for disruptive children, especially those under 4 years old. There is a need to popularise these methods in postgraduate dental education, and thereby enhance the welfare of disruptive children.

We evaluated children's overt dental behaviour with the modified 6-pointVenham scale used in previous studies[27,28]. This scale is practical in the clinic and more sensitive than the 4-point Frankl scale, and its inter- and intra-rater reliability have been established[25]. Although we also paid attention to children's anxiety when developing the modified scale and evaluating behaviour, we found that it was difficult to accurately evaluate anxiety states by assessing DV records. This was especially true for older children, who were better able to cope with dental treatment despite feeling anxiety. This was one limitation of this investigation, which instead concentrated on dental behaviour.

We found a clear distinction between dental fear and fearful behaviour displayed by the children in our study, as previously suggested[37,38]. This may be explained by the notion that a child's behaviour may be seen as the outcome of dental fear, temperament, and ability to cope with invasive situations. For some children, behaviour might also depend on individual dentist factors[9] or the invasiveness of a dental visit, although one study has indicated that the influence of the latter is relatively small[35]. Older children show greater discrepancies between dental fear and BMP, possibly due to increased coping abilities and a subsequent change in the expression of fear[39,40]. Therefore we should take equal care to treat positively behaving children and use appropriate communication techniques, as recommended by Locker *et al.*[6] for adult patients.

Several limitations of this investigation must be noted. Firstly, this study used a convenience sample from a single clinic and all treatments were carried out by one paediatric dentist, so the prevalence of children's dental behaviours we found are not necessarily representative. The prevalence of children's dental behaviour in mainland China should be determined by a multi-centre cooperative study. Secondly, a binary variable derived from the Venham scale was used in this study because it could be easily applied by a paediatric dentist during daily clinic work. Children's dental behaviour, however, varies in association with many factors, and the regression equation only provides a reference to predict a child's dental behaviour. Paediatric dentists should therefore adjust their behaviour management strategy to meet the needs of individual child patients. Thirdly, this study focused only upon children's dental behaviour. Future research that examines the aetiology of BMP, such as the effects of direct or indirect negative dental experience, personality traits, and dentist factors, is needed in China. Fourthly, the accuracy of guardian-provided questionnaire response was doubtful, especially the guardian's subjective rating of the child's anxiety or shyness around strangers and the presence or absence of conflict between the child and medical personnel. Fifthly, it was difficult to rate the behaviour of most children treated with papoose boards using the DV recorder. Most of those cases were scored as out of contact except some children gradually calmed down and were released from the papoose boards during the treatment session. Further studies could improve the behavioural assessment of such cases by adding at least one video focused on the child's face.

The results of this investigation augmented previous research in several ways. We identified four powerful factors that were predictive of children's BMP in the dental clinic, with an 87.9% correct prediction rate. The child's age, the guardian's expectation of the child's behaviour at the dental clinic, presence of anxiety or shyness with strangers, and presence of toothache were factors found to successfully predict child behaviour in our dental treatment procedures. This predictive validity was established with a relatively simple questionnaire, and a simple predictive regression equation was derived. Conflict with medical personnel was found to be a significant predictor for negative changes in dental behaviour. Further studies are, however, required to verify these results in other sample groups.

What this paper adds

- This paper provides a relatively systematic evaluation of children's dental behaviour in mainland China.
- This study determined the composition of children's dental behaviour in a group of outpatients with a wide age range (2–8 years). Previous studies have been conducted with smaller study groups, either limited in age or by attendance at specialised paediatric dental clinics. The information from this study will therefore contribute to a base of knowledge for undergraduate education, postgraduate training in paediatric dentistry, and oral health policy in mainland China and other regions. Caution should be used in the application of these findings to all children in this age range, given the large age-related differences in psychological development.
- Four variables were found to significantly predict children's dental behaviour. Three have also been reported in research conducted with Western study groups, which indicates their cross-cultural reliability in predicting children's dental behaviour. We also found the presence of toothache to be a risk factor for negative dental behaviour,. The systematic implementation of preventive oral care and community-oriented health programmes for children, especially those of preschool age, are urgently needed in China.

Why this paper is important to paediatric dentists

- Based on the results, we have drawn a regression equation: logitP = −0.884a + 1.212b + 1.063c + 0.918d + 0.955 (a: age; b: guardian's expectation; c: anxiety or shyness around strangers; d: presence or absence of toothache). The total percentage of correctly classified children is 87.9%. It is useful for the paediatric dentist to predict a child's dental behaviour based on four questions, and to identify children at risk of management problems before such problems arise. This rapid and easily administered procedure will help the dentist develop an appropriate management strategy for each child patient.

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