Prevalence, Intensity and Impact of Dental Pain in 5-Year-Old Preschool Children

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Purpose: The aim of this study was to assess the impact of clinical oral health conditions, and the prevalence, intensity and the impact of dental pain on daily living among 5-year-old preschool children.

Materials and Methods: A cross-sectional survey was carried out on a sample of 578 children attending preschools in Belo Horizonte, Brazil. Data were collected by means of a pretested questionnaire given to the parents and a visual analogue scale of faces applied to the children. The children underwent dental examinations.

Results: According to the parents' reports, the lifetime prevalence of dental pain was 25.0% (95% confidence interval, 95% CI = 21.4 to 28.6), and dental pain caused crying in 16.8% (95% CI = 13.6 to 19.9) of the children; 10.7% (95% CI = 8.1 to 13.3) of children had dental pain in the 2 months prior to the dental examination. Among this group of children with dental pain, 59.3% experienced a negative impact as a result of pain. The following clinical conditions had mostly caused dental pain in the 2 months prior to the dental examination: root remnants, fistula and pulp caries. This recent pain resulted in a visit to the clinician in 13.6% of the children.

Conclusions: Prevalence, intensity and the impact of dental pain in 5-year-old children were high in Belo Horizonte, Brazil. Dental pain assessed in the present study was associated with avoidable pathological factors. However, only few children were treated professionally for the dental pain they were experiencing. Public policies should be developed and implemented to promote fair, comprehensive treatment for the population.

Key words: cross-sectional study, dental pain, epidemiology, paediatric dentistry

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Dental pain has a marked impact on the psychosocial well-being of children and it has been cited as the main reason for seeking paediatric dental care (van Palenstein Helderman and Nathoo, 1990; Shepherd et al, 1999; Agostini et al, 2001). According to Ferreira et al (2007), the prevalence of dental caries was 53.9% and the decayed, missing or filled teeth mean was 2.34 teeth in 5-year-old Brazilian children, indicating a public health problem. Studies carried out on 5-year-old children have demonstrated that dental pain is highly prevalent, associated with caries, and is also most apparent in lower socioeconomic groups with reduced access to care (Seaman et al, 1989; Treasure and Dever, 1992; Slade, 2001). However, no studies have yet been conducted to investigate the prevalence of dental pain in 5-year-old Brazilian children, which is one of the goals of the present study.

Pain is one of the most frequently encountered symptoms in dental practice and is a complex phenomenon that involves neurological, physiological and psychological components. It is difficult to define and even more difficult to quantify pain, as it is essentially a personal experience that is made available to others only by means of verbal expression or pain-related behaviour (Locker, 1989). Assessing pain in children is all the more difficult due to variations in cognitive abilities that affect how they perceive,

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understand, remember and report pain. Specific pain assessment tools have been developed for different age groups (Versloot et al, 2006). In newborns and infants, behavioural and physiological assessment methods are used. Children between 4 and 7 years of age can provide self-reported assessments of their pain using a facial scale, and older children can report their pain verbally (Franck et al, 2000).

A number of oral conditions such as oral ulcers, tooth eruptions and dental caries can cause pain. Dental caries is the most consistent clinical correlate of dental pain, primarily in the lower socioeconomic groups with limited access to care (Slade, 2001). Thus, dental pain and the social impact of dental pain are outcome indicators of oral health (Agostini et al, 2001). Young children with dental caries are at risk of experiencing further dental pain. Levine et al (2002) determined that when dental caries was left untreated and when it affected multiple tooth surfaces, 21.0% of the children reported dental pain within 1 year and 67.0% reported pain in their teeth before exfoliation.

Despite the high prevalence of caries among young Brazilian children, there has been a very limited amount of research on the prevalence of dental pain in these children (Peres et al, 2005; Ferreira et al, 2007). Little is known regarding the experience of dental pain in the primary dentition. Such knowledge could be an important factor in defining priorities in public health policies for poor areas with high prevalence levels of caries. Thus, the aim of the present study was to assess the impact of clinical oral health conditions, and the prevalence, intensity and the impact of dental pain on daily living and respective associations with clinical oral health conditions among 5-year-old preschool children.

MATERIALS AND METHODS

A cross-sectional study was carried out on 549 children aged 5 years who attended either public or private preschools in Belo Horizonte, Brazil. The sample was selected from a population of 75,000 preschool children of the same age. Preschools are educational institutions for children who are 3 to 5 years old. In Brazil, there are public preschools supported by the government and private preschools funded by charging tuition. Belo Horizonte is the state capital of Minas Gerais. It has approximately 2 million inhabitants and is geographically divided into nine administrative districts (PBH, 2007), with considerable economic, social and cultural disparities.

To assure sample representativity, distribution was determined in proportion to the actual distribution among the preschools of the city by employing the following steps: initially, the percentage distribution of 5-year-old children pertaining to each region was calculated from the information provided by the local authorities (Health Council and Education Council); next, participant distribution was determined in proportion to the population of the respective school systems using data from the sample calculation. Eighteen preschools (nine public and nine private) were randomly selected. To provide each member of the study population an equal chance of being included, a second set was selected using the list of names provided by each preschool as reference.

Estimation of proportion allows the calculation of the sample size to give a standard error of 4.5% or less that is sufficient to reject the null hypothesis (Kirkwood and Stern, 2003). A 95% confidence interval (95% CI) and a 23.8% prevalence of dental pain in 4-year-old Brazilian children were used for the calculation (n = 344), as this was the closest age group with available data (Feitosa et al, 2005). As multistage sampling was adopted rather than a random sampling technique, a correction factor of 1.5 was applied to increase precision ($344 \times 1.5 = 516$) (Kirkwood and Stern, 2003). The minimum sample size for satisfying the requirements was estimated to be 516 schoolchildren. To minimise the losses during the data survey, the sample size was increased by 12.0%, totalling 578 preschool children (516 + 12.0% = 578).

Terms of informed consent were obtained from the participants, and the Ethics Committee for Research on Human Subjects at the Federal University of Minas Gerais approved the research project. A pilot study was first undertaken with 50 children to test the data collection method and to identify the potential difficulties in understanding the questionnaire.

Variables were collected using a questionnaire sent to the parents/guardians, as well as by means of a dental examination and a visual analogue scale of faces (VASOF). The questionnaire, developed in England and validated in Brazil, was answered by the parents (Shepherd et al, 1999; Barretto et al, 2004). The questionnaire had a total of 21 questions eliciting information on the occurrence of past experiences of dental pain, the impact of pain on child and socio-demographic information. The parents were asked about the occurrence of dental pain in their children during their lifetime as well as in the previous 2 months. This option was incorporated with the

intention of minimising information bias. Eight year old children responded to the VASOF, which was developed and validated in Brazil for the assessment of pain intensity. This was considered to be easy to carry out and easy to understand by the children (Barretto et al, 2004). The children were otherwise healthy and free of physical or mental handicaps.

Dental examinations were carried out by a single clinician (F.R.M.-L.), who participated in a training and calibration exercise for the criteria used to identify each clinical condition examined. Twenty-four children were included in the calibration process. World Health Organization criteria were used for diagnosing different stages of dental caries. Furthermore, oral fistulas and ulcers, gingivitis, physiological tooth mobility, permanent molar eruption and dental trauma (crown fracture) were assessed (World Health Organization, 1980; Kleinman et al, 1994). Teeth that presented caries lesions were classified in the following manner: arrested caries lesion involving dentine (dark brown to black colouration and hard, dry surface); active caries lesion involving dentine (yellow to brown colouration and soft, moist surface); caries lesion involving pulp (presenting connection to pulp chamber); and root remnant (with complete crown destruction). Filled teeth with the necessity of repairs were classified as filled and decayed. Intraexaminer agreement calculated on a tooth-by-tooth basis was high (minimum and maximum kappa values were 0.75 and 1.00, respectively). Training for the clinical diagnosis entailed the use of colour transparencies to show the major clinical characteristics of each lesion of interest and the lesions to be considered in the differential diagnosis. Examinations were conducted at school during daytime class hours. An artificial light on the examiner's head and a disposable mouth mirror (PRISMA®, São Paulo, SP, Brazil) were used. During the examination, the examiner was seated in front of the child, who remained standing. The examiner visited each school on two separate occasions to account for student absenteeism. Dental instruments and necessary materials were packed and sterilised in sufficient quantities for each workday.

The social vulnerability index (SVI) was used for socioeconomic classification. This index measures the social exclusion in the city of Belo Horizonte. It encompasses over 20 variables that quantify the population's access to housing, schooling, income, jobs, legal assistance, health and nutrition. Thus, the SVI measures social access and determines to what extent the population of each region of the city is vulnerable to social exclusion. We used city hall database of SVI scores for each district based on the address of each family (PBH, 2007).

Results were entered and organised into a database using the Statistical Package for Social Science (SPSS, IL, USA), version 12.0. A description of the absolute and relative frequencies of the variables was provided. The 95% CI for the main prevalence figures were calculated using the following formula:

$$P(1.96 \times \sqrt{[p \times (1-p)/n]}),$$

where p is the proportion and n is the sample size.

RESULTS

A total of 578 children were included in the sample and the questionnaires were sent to their parents/guardians. Although efforts were made to reduce the number of uncompleted questionnaires, 29 were not returned or were not completely filled out, giving an overall response rate of 95.0%. Therefore, the present analysis includes data from 549 children and their parents; 50.1% of the sample were boys and 49.7% pertained to the most vulnerable social classification. The parents answered the questionnaires; the children responded to the VASOF and were also examined for the dental assessment.

The prevalence frequency (95% CI) of lifetime dental pain and pain in the 2 months prior to the study as reported by parents/guardians was 25.0% (21.4 to 28.6) and 10.7% (8.1 to 13.3), respectively. Dental pain caused crying in 16.8% of the sample (13.6 to 19.9).

The data in Table 1 display a description of the dental pain experienced in the 2 months prior to the dental examination, as reported by parents/guardians. Among the children who experienced pain, 66.1% belonged to the most vulnerable social class and 42.4% had experienced three or more episodes of pain. The type of pain that the children felt most often was intense. In 52.5% of the children, pain was triggered by eating and in 22.0% of the children dental pain occurred spontaneously. In order to care for the child, 45.7% of the parents/guardians reported missing work. A total of 35.6% of parents/guardians administered medicine to the child during episodes of pain. Only 13.6% took the child to a clinician; 22.0% of the parents/guardians reported doing nothing to alleviate the child's pain. Dental pain hampered the daily activities in 59.3% of these children. The majority of children had difficulty in eating.

The data in Table 2 display the clinical conditions and the proportional prevalence of pain in the

Table 1 Description of social variables and characteristics of dental pain in the 2 months prior to the dental examination as reported by parents/guardians (N = 59) related to its impact on the lives of the children and the families

Variable	n (%)
Social	
Less vulnerable	20 (33.9)
More vulnerable	39 (66.1)
Number of episodes of pain	
One	17 (28.8)
Two	17 (28.8)
Three or more	25 (42.4)
Intensity of pain	
Very mild	10 (17.0)
Mild	10 (17.0)
Moderate	4 (6.7)
Intense	22 (37.3)
Very intense	13 (22.0)
Trigger of pain	
When eating	31 (52.5)
Spontaneously	13 (22.0)
Others	15 (25.4)
Who looked after the child	
Mother	46 (77.9)
Father	3 (5.1)
Grandparent	9 (15.2)
Sibling	1 (1.7)
What the caregiver stopped doing in order to be with the child*	
Working	27 (45.7)
Housekeeping; taking care of other children	12 (20.3)
Other tasks	9 (15.2)
Parents' response to pain	
Tablets/medicine	21 (35.6)
Take the child to a clinician	8 (13.6)
Did not do anything	13 (22.0)
Told the child to brush teeth	7 (11.8)
Told the child not to eat	5 (8.5)
Comforted/soothed the child	5 (8.5)
The pain stopped the child from:†	
Eating	32 (54.2)
Brushing teeth	23 (38.9)
Sleeping	11 (18.6)
Playing	9 (15.2)
Going to school	7 (11.8)
Total impact††	35 (59.3)

*48 parents/guardians reported stopping something in order to care for the child; †answers are not mutually exclusive; ††these children had at least one of their daily activities affected.

previous 2 months. According to the dental assessment, 204 children presented pathological or physiological problems that could lead to pain. Among these children, 51.5% experienced pain in their lifetime and 23.0% experienced pain in the previous 2 months. The clinical conditions that most frequently caused dental pain in the previous 2 months were root remnants, fistula and caries lesions involving pulp. Pain of a physiological origin occurred in the previous 2 months among 8.7% of the children who presented physiological mobility in the primary teeth and among 24.1% of the children whose permanent first molars were erupting.

DISCUSSION

The results of the present study show that the prevalence of lifetime dental pain in 5-year-olds was similar to that found in the studies carried out in England and New Zealand (Seaman et al, 1989; Treasure and Dever, 1992). On the other hand, the prevalence over both the lifetime and the previous 2 months was lower than that found in studies with 8-year olds (Shepherd et al, 1999; Naidoo et al, 2001; Ratnayake and Ekanayake, 2005). Variations in age, sample recruitment, dental caries patterns and severity may be an explanation for this difference.

The option was made to investigate dental pain using reports from parents/guardians, as other studies have demonstrated that recall bias may result from the under-reporting of dental pain on the part of the children and that the parents could be used as a good proxy measure (Ratnayake and Ekanayake, 2005). Young children with dental disease do not necessarily complain of pain, in part because they do not fully understand the concept of dental pain and find it difficult to verbalise feelings of pain in a valid, reliable manner. Pain is a complex multidimensional construct with both sensory and affective components. Anxiety could be an affective component that may influence pain perception (Margetic et al, 2005). On the other hand, experts in the field of pain assessment have noted that parents may be the best proxy measures available for cognitively impaired individuals. Therefore, parents have been extensively interviewed regarding their observations of pain behaviour (Stallard et al, 2002; Versloot et al, 2006).

Most of the children with dental pain were from the lower socioeconomic group. This result corroborates with the findings in other studies that demonstrate the negative effects of a low socioeconomic level on the clinical oral condition of the population (Honkala et al, 2001; Slade, 2001; Barretto et al, 2004; Feitosa et al, 2005; Ratnayake and Ekanayake, 2005). Cultural or behavioural theories attempt to explain inequalities in health in terms of social class

Table 2 Description of clinical oral health condition and dental pain experienced over the lifetime and in the 2 months prior to the dental examination

Clinical condition	Lifetime (N = 137) n (%)	Previous 2 months (N = 59) n (%)	Previous 2 months (% of total, N = 549) n (%)
Number of carious teeth			
None	33 (10.2)	13 (4.0)	13 (2.4)
One to three	48 (39.3)	20 (16.4)	20 (3.6)
Four or more	56 (53.8)	26 (25.0)	26 (4.7)
Caries lesion involving pulp			
No	109 (21.2)	41 (7.9)	41 (7.5)
Yes	28 (82.3)	18 (52.9)	18 (3.3)
Active caries lesion in dentine			
No	55 (13.8)	11 (2.8)	11 (2.0)
Yes	77 (51.0)	48 (31.8)	48 (8.7)
Arrested caries lesion			
No	89 (19.4)	42 (9.1)	42 (7.6)
Yes	48 (53.3)	17 (18.8)	17 (3.1)
Root remnant			
No	118 (22.3)	45 (8.5)	45 (8.2)
Yes	19 (95.0)	14 (70.0)	14 (2.5)
Fistula			
No	124 (23.2)	51 (9.5)	51 (9.3)
Yes	13 (86.7)	8 (53.3)	8 (1.5)
Dental trauma (crown fracture)			
No	132 (26.7)	55 (11.1)	55 (10.0)
Yes	5 (9.1)	4 (7.3)	4 (0.7)
Filled teeth			
No	100 (21.1)	40 (8.4)	40 (7.3)
Yes	37 (49.3)	19 (25.3)	19 (3.5)
Filled and decayed			
No	24 (4.5)	53 (10.0)	53 (3.6)
Yes	13 (65.0)	6 (30.0)	6 (1.1)
Oral ulcers			
No	128 (23.8)	57 (10.6)	57 (10.4)
Yes	9 (69.2)	2 (15.4)	2 (0.4)
Gingivitis			
No	105 (20.9)	35 (6.9)	35 (6.4)
Yes	32 (69.6)	24 (52.2)	24 (4.4)
Professional opinion – clinical condition could lead to pain			
No	32 (9.3)	12 (3.5)	12 (2.2)
Yes	105 (51.5)	47 (23.0)	47 (8.6)
Physiological mobility			
No	104 (24.6)	48 (11.3)	48 (8.7)
Yes	33 (26.2)	11 (8.7)	11 (2.0)
Permanent molars erupting			
No	117 (23.6)	46 (9.3)	46 (8.4)
Yes	20 (37.0)	13 (24.1)	13 (2.4)

differences regarding knowledge, attitudes and behaviour. People in the lower socioeconomic groups are believed to be less healthy because they more frequently consume unhealthy foods, with diets that are high in fat and sugar, as well as low in fibre. Such individuals are also said to make less use of preventive health services such as dental visits (Locker, 1989).

Regarding the degree of pain, most children rated the pain that they experienced as either intense or very intense, which is in agreement with the findings

from other studies (Shepherd et al, 1999; Naidoo et al, 2001; Barretto et al, 2004; Ratnayake and Ekanayake, 2005). The VASOF was validated so that 8-year-old children were able to respond. However, this has not been formally tested for validity and reliability in 5 year olds, which we recommend for future studies. However, studies that assess the intensity of pain through reports by parents/guardians have demonstrated low levels of sensitivity in identifying the time their children had experienced intense pain (Bailit, 1987; Chambers et al, 1998; Kelly et al, 2002).

A number of studies point out the key role of the mother as the principal caregiver and, as such, her other daily activities are interrupted when her child becomes ill (Kawabata et al, 1997; Fonseca et al, 2004). In the present study, 45.7% of the caregivers did not go to work so that they could care for their children with dental pain. However, in our study only 13.6% of the parents/guardians sought dental care, whereas Shepherd et al (1999) and Ratnayake and Ekanayake (2005), respectively, found that 21.0% and 42.0% of parents/guardians sought dental care for children with dental pain. One explanation for this is the difficult access to public oral health services among the Brazilian population; only a small portion of Brazilians can afford dental treatment. Recent data indicate that 13.0% of Brazilian adolescents have never been to a dentist; 20.0% of adults and elderly Brazilians have lost all their teeth and 45.0% of Brazilians have no regular access to a toothbrush (Health Ministry, 2007).

Dental pain had a significant effect on the well-being of the children, with 59.3% reporting one or more negative impacts as a result of the pain. The most commonly reported impact was 'difficulty in eating', which was also noted in other studies (Low et al, 1999; Shepherd et al, 1999; Feitosa et al, 2005; Ratnayake and Ekanayake, 2005). Difficulty in eating may contribute to malnutrition rates, suggesting that children with severe caries may be of a lower height and weight than children who are free from caries (Miller et al, 1982; Ayhan et al, 1996).

Decayed tooth in an advanced stage was cited as the most common cause of dental pain in the children (Slade, 2001; Barretto et al, 2004; Ratnayake and Ekanayake, 2005). The carious dentine that is most likely to cause pain are the molars with larger caries lesions, presenting shortly after eruption. The earlier a tooth decays prior to natural tooth loss, the longer it remains in the mouth and the greater the likelihood of pain (Levine et al, 2002). It is important for future researchers to make an attempt to separate the prevalence of dental pain caused by physiological factors from avoidable pathological factors (Shepherd et al, 1999). The present study found that among the 226 children who presented with caries lesions/decayed teeth, 20.3% had experienced pain in the previous 2 months and 46.0% had experienced dental pain in their lifetime. Furthermore, among the 180 children who presented physiological mobility and permanent teeth eruption, 13.3% had experienced pain in the previous 2 months and 29.4% had experienced dental pain at some point in their lives. Other oral problems such as dental trauma, oral ulcers and especially gingivitis can cause pain in preschool children. Despite the fact that caries was the cause of dental pain in the majority of cases, one should consider that a large proportion of the 5-year-old children reported dental pain due to physiological causes.

The dental examination found 204 children with oral alterations that could be causing or could have caused dental pain. However, 47 reported to have experienced dental pain in the previous 2 months and 105 reported to have experienced dental pain in their lifetime. A number of studies have found that the prevalence of dental pain is lower than the prevalence of caries and other oral alterations (Low et al, 1999; Feitosa et al, 2005; Versloot et al, 2006). Levine et al (2002) found that among 1,587 non-treated, carious primary teeth, only 15.8% presented painful symptoms and the other 84.2% remained symptom-free until being lost. As caries is considered an important public health problem in Brazil, this information is extremely relevant to the definition of criteria that can aid clinicians in making the best management decisions and in assessing which children should be given priority treatment.

In conclusion, the findings of the present study indicate that the prevalence and impact of dental pain in 5-year-old children was high in Belo Horizonte, Brazil. Both pathological and physiological conditions may be related to dental pain. Knowledge of oral and social problems that trigger pain can be used to establish preventive and treatment priorities.

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