

Perceptions of Australian Mothers on Infant Teething: A Pilot Investigation Using a Mixed Methods Approach

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Objective: The purpose of this study was to develop and pilot a telephone interview questionnaire on parental perceptions on symptoms and management of infant teething, prior to implementing a larger project. **Methods:** Child and Family Health Nurses in Sydney South West recruited mother-infant dyads (n=187) during a home visit soon after the child's birth. Using a mixed methods approach, information on parental beliefs on teething related symptoms and home management techniques and demographic data were obtained via a telephone interview when the child was four to twelve months old. Frequency distributions were calculated using SPSS version 19 software and the qualitative data were analysed using a framework approach. **Results:** Mothers in general were unsure what teething symptoms were and would attribute symptoms caused by external factors to teething. Nearly all mothers (n= 168) believed that tooth eruption was associated with some form of child morbidity. Mothers reported biting (91.7%), dribbling (71.4%) and irritability (57.1%) were the most common symptoms associated with infant teething. A substantial minority reported potentially serious symptoms such as appetite loss, susceptibility to infections, diarrhoea and vomiting to teething. The use of teething rings or other objects to chew on, analgesics such as paracetamol, and topical analgesic gels were remedies commonly used to relieve teething related symptoms. Some mothers reported potentially harmful remedies to relieve teething. **Conclusions:** The questionnaire was acceptable to parents and useful data were collected for future longitudinal studies. Infant teething appears to be a distressing phenomenon for mothers with young children. Many parents were still unsure about what teething symptoms are attributed to teething and may not be managing their child correctly. Further education is needed for mothers in terms of recognising teething and managing it appropriately.

Key words: Teething, parent, oral health, perceptions, tooth eruption

INTRODUCTION

Infant teething is defined as the process of tooth eruption in the primary dentition (Ireland, 2010) and represents a natural phenomenon by which the tooth moves from its developmental site to its functional position in the oral cavity (Marks and Schroeder, 1996). The first tooth usually erupts between 4-10 months and the eruption of the primary teeth is completed by 30 months of age (Wake *et al.*, 1999). The dental follicle, which surrounds the developing tooth, contains eicosanoids, cytokines and growth factors which can sensitise pain afferent nerve fibres and lead to pain, tenderness and local inflammation (McIntyre and McIntyre 2002; Sood and Sood, 2010). As a result, infant teething is an ill-defined condition that parents and some health care professionals such as child and family health nurses, pharmacists, general practitioners, dentists and paediatricians have associated with a variety of general and oral symptoms (Seward, 1972; Carpenter, 1978; Wake *et al.*, 1999; Wake *et al.*, 2000; Wake and Hesketh, 2002; Wilson and Mason, 2002; Sarrell *et al.*, 2005).

Several cross-sectional studies have reported that parents believe local symptoms; such as pain, inflammation, drooling, increased biting, sucking, gum-rubbing and systemic symptoms such as irritability, sleep disturbance, low-grade fever, facial rash, nappy rash, ear rubbing, intra-oral ulcers, diarrhoea, vomiting, decreased appetite and infections of skin, respiratory tract

or ear can be attributed to teething (Seward, 1972; Carpenter, 1978; Marks and Schroeder, 1996; Wake *et al.*, 1999; Wake *et al.*, 2000; Wake and Hesketh, 2002; Wilson and Mason, 2002; Baykan *et al.*, 2004; Sarrell *et al.*, 2005; Feldens *et al.*, 2010; Sood and Sood, 2010). Further, the available evidence from longitudinal studies has reported varying results. As an example, a prospective cohort study by Macknin *et al.* (2000) of 125 children with 475 tooth eruptions found that increased biting, drooling, gum rubbing, sucking, irritability, wakefulness, ear-rubbing, facial rash, decreased appetite for solid foods, mild temperature elevations were significantly associated with teething. Conversely, a prospective cohort study by Wake *et al.* (2000) on 21 children with 90 erupted teeth could not find a significant association with tooth eruptions and teething symptoms.

There has also been much speculation that teething serves as a 'scapegoat' diagnosis for many symptoms experienced by infants during the period coinciding with tooth eruption. The period where teething is initiated coincides with the time where the child loses immune protection from maternal antibodies and the child begins to explore their environment by putting objects in their mouth. There has been much debate as to which symptoms can be attributed to teething and which have a temporal association to other childhood illnesses (Macknin *et al.*, 2000; Wake *et al.*, 2000). Consequently, parents use both

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non-pharmacological and pharmacological approaches to relieve the teething symptoms (Wake *et al.*, 1999; Feldens *et al.*, 2010; Sood and Sood, 2010). These include the use of cold teething rings, gum massage, analgesics and topical anesthetic agents (Wake *et al.*, 1999; McIntyre and McIntyre, 2002).

There have been few studies that report on parents' perceptions of teething symptoms and management approaches in Australian children (Wake *et al.*, 1999; Wake *et al.*, 2000). One cross-sectional study on 95 parents in Victoria, Australia reported on parental distress caused by infant teething and found that the symptoms reported by parents for their child were closely correlated with teething symptoms that parents believed to be experienced by infants in general (Wake *et al.*, 1999). They noted that the amount of infant distress during teething correlated with more 'difficult' infant temperament, and parent distress increased with the longer duration of teething symptoms. Apart from this study, there is limited evidence on the impact of infant teething on the quality of life. Therefore, the purpose of this pilot study was to determine parental perceptions on teething related quality of life in order to provide adequate education to parents on this oral health concern faced by almost all parents in the early stages of the child's life.

METHODS

Sample

Parents of infants that were born in late 2010 in Sydney South West Local Health District (n=200) were approached by Child and Family Health Nurses at a first post-natal home visit (Arora *et al.*, 2011). The home visit is part of the New South Wales (NSW) Early Childhood Health Services, a free service that offers health and developmental checks for infants and support, education and information on parenting. Parents were provided with an introductory letter outlining the aims of the study, and all parents that agreed to participate were subsequently followed up by telephone interviews when the child was between four and 12 months of age.

Questionnaire development

The questionnaire was developed from questionnaires from previous teething studies (Seward, 1972; Carpenter, 1978; Marks and Schroeder, 1996; Wake *et al.*, 1999; Wake *et al.*, 2000; McIntyre and McIntyre 2002; Wake and Hesketh, 2002; Wilson and Mason, 2002; Baykan *et al.*, 2004; Sarrell *et al.* 2005; Feldens *et al.*, 2010; Owais *et al.*, 2010; Sood and Sood, 2010).

Part 1: Quantitative phase

Specific teething symptoms and quality of life measures such as fever, pain, dribbling, biting, red cheeks, nappy rash, diarrhoea, irritability, sleep disturbance, appetite loss, susceptibility to infections and vomiting were recorded. Parents were asked about the management strategies used; paracetamol or non-steroidal anti-inflammatory use, teething rings and dummies. Teething symptoms and management techniques were dichotomised.

Part 2: Qualitative phase

Qualitative data collection in the form of open ended questions

was also used to enrich data quality and to provide an insight to teething related quality of life. Mothers were asked to explain their experiences on how teething affected the baby's and the parent's family life. The questionnaire underwent pilot testing and modification prior to final administration.

Data Collection

A telephone interview was conducted with the mother, when their baby was between four and 12 months old to gather information on parental beliefs on teething related symptoms and home management techniques used for relief for teething symptoms. Demographic data were also obtained at the interview. The interviews were digitally recorded and the qualitative information was transcribed at a later date. After the interview each parent was posted a teething ring, a sipper cup and health education leaflet developed by the NSW Health. Parents also had the opportunity to ask questions and gain advice through a free telephone helpline. Parents were contacted on five separate occasions during the day and in the evening on both weekdays and weekends to enable the interview to be conducted at a time convenient to the parent. If telephone details were incorrect or the telephone disconnected, reminder letters were mailed to allow the mothers to contact the study. Some mothers were lost to follow up since they were unable to be contacted.

Data Analysis

Quantitative data were analysed using SPSS version 19 software. Frequency distributions were calculated. The qualitative data derived from the open-ended questions were analysed using a framework approach by grouping responses into discrete categories.

Ethics approval

The study was approved by the University of Sydney Ethics Committee and South Western Sydney Local Health District Ethics Committee.

RESULTS

Of the 200 mother-infant dyads that were recruited in the study, 187 continued to be a part of the study at the follow up phone interview when the child was four to 12 months old. The demographic details of the population sample are shown in *Table 1*. The mean age of the mother was 30-years-old (Range: 19-44 years). The reported mean gestational age was 39 weeks (Range: 25-48 weeks) with the baby weighed 3,523 grams on average.

Ninety percent of the mothers (n=168) reported teething symptoms in their child. Most mothers believed that teething caused multiple symptoms. *Table 2* illustrates the frequency of teething symptoms reported by mothers. Local symptoms such as biting were the most common symptoms reported (91.7%) while (57-71%) also reported dribbling and irritability as being commonly associated. The mothers reported that their child's gums appeared: "swollen", "bulging", or "having a lump". Some mothers also noted that when their child's teeth were erupting their child would "scratch" or "keep their fingers in the mouth" or "cut the rubber of the baby bottle".

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Around one third of mothers reported red cheeks, pain, wet nappies, and potentially serious problems such as diarrhoea or infections to teething (31-35%). Less than a quarter ascribed fever, nappy rash, appetite loss, pulling ears and sleep disturbance to teething with the least reported symptom was vomiting (4%). Some mothers reported that the baby “*went off feeding during the days his teeth are coming through*” or “*had a loose bowel and it was a nuisance as her [daughter’s] nappies had to be changed every few hours*” and “*[the child] cried a lot at night and was unsettled*”.

All mothers who believed that their child was teething reported to use at least one strategy to help relieve teething symptoms. Teething management techniques are illustrated in *Table 3*. The most common (74.4%) management strategy was using teething objects such as teething rings, rusks and keys. Teething gels and analgesics were used by many mothers (42.9%) whilst gum massage, dummies and naturopathic relief methods were used by a minority (6-12%). The use of cold objects such as “*cold compression*”, “*cold teething rings*” or “*crushed ice*” were reported by some mothers to manage teething. Interestingly, some mothers reported that panadol [paracetamol] “*helped the baby in case the child had fever and reduced the inconvenience of having a sick baby*”; “*helped to keep the baby calm*” or “*helped them [parent] in better parenting as they could manage the settled child*”. A few mothers from culturally and linguistically diverse families reported to use “*herbal tablets to relieve itchiness*”. Some mothers reported management techniques that may have potentially serious consequences such as “*bread crust dipped in red wine*” or allowing their baby to “*sleep on their [mother’s] stomach*”.

A few mothers attributed other dental pathology to teething; a few reported that their child was grinding their jaw, and another few reported red spots around the lips with unbearable pain for the child.

“Her gums get really hot and she has red spots around her lips. She cries like she’s in pain. As a result, I had to take time off work and bring her to a doctor today as I am worried”.

Other mothers reported of having to give up breastfeeding due to teething.

“I had to give up feeding him through the breast when he was four months as he bit my nipples so hard.”

Many mothers were unsure of what teething symptoms were.

“I didn’t realise at the start... the baby become cranky and was whinging but was fine after three days”

“I don’t really know the signs but read up on it and she is dribbling lots and biting on her soft toys but I am not really sure if it is teething”

“I don’t know if he is teething yet, he is dribbling but I can’t see the bottom gum turning white”

“She hasn’t given me any indication that she is teething, she tries

to put everything in her mouth, but apart from that she has not done anything - I mean she is not unsettled, or nappy rash like babies usually have.”

Some mothers also reported that the doctor or a family member told them that their child was teething. Attributing teething symptoms to another disease or process were also reported by some mothers.

“[My child] had the flu at the time he was teething so it’s hard to tell if teething caused the flu”

“I’m not sure, he puts everything in his mouth and rolls over as well which might be causing red cheeks”.

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Table 1. Socio-demographic Characteristics of the Parents

Characteristic	Number	Percentage (%)
<i>Marital Status</i>		
Married	145	77.5
De Facto	21	11.2
Single Mother	21	11.2
<i>Country of birth Mother (n=187)</i>		
Australia	112	59.9
English Speaking country	10	5.3
Non- English speaking country	65	34.8
<i>Country of birth- Father (n=168)</i>		
Australia	95	50.8
English Speaking country	3	1.6
Non- English speaking country	70	37.4
<i>Aboriginal or Torres Strait Islander</i>		
Mother	1	0.5
Father	2	1.1
<i>Mother Education</i>		
Not completed high school	19	10.2
Completed high school	39	20.9
TAFE or University qualification	129	69.0
<i>Mother Occupation</i>		
Professional/ Manager	73	39.0
Other employed	85	45.5
Unemployed	29	15.5

DISCUSSION

Results from this pilot study found that local symptoms such as biting and dribbling were the most commonly reported symptoms and the majority of parents used teething rings or rusks to manage teething symptoms. Qualitative data revealed that many mothers were unsure of what teething symptoms were and attributed symptoms to teething that may have been due to another cause. Quality of life measures such as unsettled child, pain, sleep disturbance, susceptibility to infections, diarrhoea and vomiting were reported by a number of parents.

Almost 90% of mothers from this study reported their child suffered teething symptoms within their first year of life. This proportion of parents reporting teething symptoms were similar to an Australian study over 10 years ago (Wake *et al.*, 1999) but different compared to other population groups in different countries (Macknin *et al.*, 2000; Baykan *et al.*, 2004). It has been shown in previous studies that teething symptoms are consistent across all maternal education levels however it may still differ between different cultures (Wake *et al.*, 1999; Baykan *et al.*, 2004; Owais *et al.*, 2010). Although a substantial proportion of mothers were born outside Australia and potentially are from different cultures and backgrounds, results from this study are similar to the Australian studies (Wake *et al.*, 1999; Wake *et al.*, 2000).

Teething symptoms and management techniques reported by mothers were very similar to previous studies (Wake *et al.*, 1999; Baykan

et al., 2004; Feldens *et al.*, 2010; Owais *et al.*, 2010). Local symptoms such as biting and dribbling were consistently the most reported symptoms (Wake *et al.*, 1999; Owais *et al.*, 2010). It is thought that drooling, dribbling, gingival itching and sleep disturbance may represent normal developmental stages rather than be pathological of teething (Wake *et al.*, 2000; Feldens *et al.*, 2010). This is important as if wrongly attributed to teething it may prevent mothers from implementing simple measures such as sleep and behaviour programmes. An Australian study (Wake *et al.*, 1999) noted that most mothers (65%) used teething symptoms to assess if a tooth was erupting rather than objective evidence such as visualising the tooth erupting (36%) or through palpating the gum (43%). A few mothers in our study reported they used visual and tactile stimuli when assessing if their child was teething such as the “gum turning white” or the “gum getting hot”. It would be interesting to gather in further studies to place visual and tactile ‘symptoms’ in questionnaires related to teething symptoms to determine if mothers use a combination or certain stimuli alone to establish if their child is teething.

Despite mothers reporting on local symptoms, a substantial proportion still attributed potentially serious medical conditions to teething. This may be a cause for concern as it may lead to mismanagement or late diagnosis of conditions that may otherwise be treated promptly. The teething period of 6-24 months coincides with the reduction in

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Table 2. Infant teething symptoms reported by the mother

Symptom	Frequency	Percent (%)
Biting	154	91.7
Dribbling	120	71.4
Irritable/ Grumpy	96	57.1
Red Cheeks	58	34.5
Pain	54	32.1
Wet Nappies/ Diarrhoea	54	32.1
Other Infections (ear, respiratory, skin)	53	31.5
Fever	39	23.2
Nappy Rash	39	23.2
Appetite Loss	34	20.2
Pulling Ears	28	16.7
Sleep Disturbance	22	13.1
Vomiting	7	4.2

Table 3. Management strategies used by mothers for infant teething

Management strategy	Frequency	Percent (%)
Teething Ring, Rusks, Keys	125	74.4
Analgesics (Paracetamol or NSAIDs)	72	42.9
Teething Gels	72	42.9
Gum Massage	20	11.9
Dummy	22	13.1
Naturopathic relief methods	11	6.5

maternal humoral immunity and when a child begins to explore their environment, predominantly through their mouth (Carpenter, 1978; King, 1994; McIntyre and McIntyre, 2002; Sood and Sood, 2010). This may lead to symptoms such as vomiting and diarrhoea. Fever, irritability and appetite loss may be due to undiagnosed primary herpes (King, 1994). Alternatively, fever and facial rash may also be due to Human Herpes Virus 6 (HHV-6) (Pinkham, 1999).

Pain reported in teething (Jaber *et al.*, 1999) is most likely due to the dental follicle, which is a rich source of eicosanoids, cytokines and growth factors that can lead to localised inflammation and pain. As a result, biting may act as a method of pain relief. The use of teething rings and cold objects are an ideal and well recognised management strategy for this localised pain as the objects apply pressure and the cold temperature causes localised vasoconstriction, reducing inflammation (Seward, 1969; Sood and Sood, 2010). In our study, mothers reported the use of cold to manage teething. Several studies have suggested parents use chilled or frozen teething rings, vegetables or fruit to manage teething (Seward, 1969; Nield *et al.*, 2008; Feldens *et al.*, 2010; Sood and Sood, 2010;). Mothers indeed need to be educated that teething rings should be chilled to provide most benefit yet be aware of the risks of cold injury from using very frozen items (Nield

et al., 2008).

When comparing teething symptoms and management techniques to those in studies by Wake *et al.* (1999, 2000) there are a few notable differences. Pain was the most commonly reported symptom by parents in the studies by Wake *et al.* (1999, 2000) whereas only 32.1% of mothers in our study reported pain. Consequently, a low proportion of mothers in our study used paracetamol and teething gels as a method to relieve teething symptoms. This is a positive sign as prolonged and excessive use of oral and topical medications may have adverse economic costs (Wake *et al.*, 1999; Feldens *et al.*, 2010). Additionally, it may pose risks of chemical burn, overdose and toxicity (Wilson and Mason, 2002; Williams *et al.*, 2011). A study by Wake and Hesketh (2002) on health care workers found that paracetamol and teething gels were widely recommended by all health care groups (nurses, dentists, pharmacists, general practitioners, dentists and paediatricians). After the recent case reports (Williams *et al.*, 2011) concerned with the potential toxicity of salicylate containing teething gels, it would be interesting to note the differences in what health care professionals recommend to parents to manage teething.

The mixed methods approach in this study also allowed us to provide an insight on mothers' perceptions of infant teething symptoms

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and management techniques. Some techniques, such as dipping bread in wine or allowing the child to sleep on the mother's stomach could lead to potential serious consequences for the child. It is interesting to note that most health professionals (Wake and Hesketh, 2002) recommend the use of sedating medications and few professionals recommend naturopathic or antibiotic medications. In our study no mother reported the use of sedating medications or antibiotics to treat teething however a minority were still using naturopathic methods of teething relief. Homeopathic treatment for teething involves the dilution of products such as belladonna, a toxic substance. Although it is claimed to be safe due to the high dilution concentration, the containers are not childproof so they should be kept at a distance from the child (Ocasio *et al.*, 1999; Jordan, 2005). These remedies are targeted at the child's agitation and non-specific symptoms and are thought to treat the child as a whole and make it easier for the parent to manage their child (Jordan, 2005). These findings highlight the importance that mothers not only need to know what to attribute to teething but also how to recognise potentially serious symptoms and manage their children appropriately.

Some mothers from our study were unsure of what teething symptoms were and if they were attributed to teething. One possible explanation for this may be due to cultural differences. Some mothers began to attribute symptoms to other child's daily activities, such as rolling on the floor. It has suggested that mothers may attribute persistent symptoms to a cause they can manage simply and legitimately with the non-judgemental support of family and friends (Wake *et al.*, 2000; Sarrell *et al.*, 2005). In contrast, if potentially dangerous symptoms are attributed to teething, problems may arise. A study by Wake *et al.* (1999) found that parent perceived diarrhoea less seriously when it was attributed to teething however infants with "teething diarrhoea" were just as likely to develop dehydration when compared with "non-teething" diarrhoea. Data suggesting that some mothers were unsure if their child was teething but was "told" by doctors or family members, highlight the need for further education on recognising teething symptoms and management by both parents and health care professionals.

A mixed methods approach on teething enabled us to see how teething can affect mothers and their child's quality of life and provided an insight into the broad range of teething symptoms and management strategies mothers' employ. The telephone questionnaire was successful as mothers were happy to discuss teething related concerns and may be used in longitudinal research on infant teething to note if teething perceptions change over time. There may be a potential recall bias in our study as the study relied on participant's recall of child symptoms during the first year. Although phone interviews were conducted at a time convenient for the mother, there were times where the child would get restless during the interview which may have altered the responses received. Further studies inclusive of a mixed methods approach should utilise a larger population size and could explore the potential sources of information mothers use to get information on teething.

CONCLUSIONS

This telephone interview was acceptable and a mixed methods approach was successful in gaining an in depth understanding of the impact of teething related quality of life. Teething is an ill-defined condition in infants to which the majority of parents believe causes a

wide range of symptoms. Many parents were unsure of what symptoms to attribute to teething and how to recognise teething however continue to employ management techniques to relieve teething symptoms. This study highlights the need to provide proper health education to mothers of teething infants which is acceptable, informative and supported by evidence.

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Conflict of interest

None known.

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