

Influence of Maternal Dental Anxiety and Attendance Pattern on Dental Caries Experience Among Preschool Children of Mysore City, India—A Cross-Sectional Study

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Abstract

Background

Maternal dental anxiety and dental attendance patterns are suggested as indicators of preschool child dental health and for taking the child to dental care. The relationship is still unclear and there is scarcity of literature in the Indian context which needs to be explored.

Aim

To assess the influence of maternal dental anxiety and attendance patterns on dental caries experience among 2-5 year old preschool children in Mysore city, India.

Design

An analytical cross sectional study was conducted on a stratified random sample of 635 mother child dyads. A pre tested proforma collected information on maternal dental anxiety using Modified Dental Anxiety Scale (MDAS), dental attendance pattern (regular, occasional, emergency, never) and dental caries using dmft and dmfs indices . Descriptive analysis, Chi-square test, Kruskal-Wallis test, Spearman correlation test and a binary logistic regression model was used.

Results

The dental caries prevalence among preschool children was 40.6%. Mothers who exhibited low, moderate and high dental anxiety were 50.2%, 39.1%, 10.7% respectively. Majority (34.5%) of the mothers were found to have never visited a dentist. A statistical significant difference was found between maternal dental attendance and dental caries ($p < 0.05$). Mean dental caries score was found to increase with increase in maternal dental anxiety levels but was not statistically significant ($p = 0.537$). In the binary regression model, maternal dental attendance was significantly associated with dental caries ($p < 0.05$)

Conclusion

In the present study, an indirect association between maternal dental anxiety and dental caries experience may be inferred through maternal dental attendance pattern.

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Introduction

Dental caries is still a major oral health problem in most industrialized countries, affecting 60–90% of school children and the vast majority of adults. It is also a most prevalent oral disease in several Asian and Latin-American countries, while it appears to be less common and less severe in most African countries[1].

Dental caries has detrimental consequences on children's quality of life by inflicting pain, premature tooth loss, malnutrition and finally influences overall growth and development. The children suffering from poor oral health are 12 times more likely to have restricted activity days as compared to those who did not[2].

The prevalence of dental caries among pre-school children of developed nations has been declining over the past few decades. However, current evidence shows that this decline has ceased in certain developed countries, and the prevalence is still high among preschoolers of developing nations.² In India, findings from three studies among preschool children showed prevalence of dental caries to be 48%, 54.1%, 63.4% respectively[1,3,4]. As for local statistics, a study reported a caries prevalence in 3-6 year old preschool children to be 56.6% with a mean dmft and dmfs of 2.20 and 2.97 respectively[5].

Oral health in preschool children is to a large extent determined by behavioural factors[6]. Children are dependent on their environment to establish favourable health behaviours[7]. The mother and the family are part of the child's environment influencing child development and the establishment of oral health behaviours[8]. Young children's dental health

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relies on the parents' involvement and support from the dental services[7]. It has been reported that parent's behaviours and attitudes towards oral health are associated with child's dental health[7,9]. Moreover, mother's attitudes and beliefs about dental care are major determinants of whether she takes her child to dentist[10].

Dental anxiety has been defined as an 'Abnormal fear or dread of visiting the dentist for preventive care or therapy and unwarranted anxiety over dental procedures'[11]. In adults, dental anxiety has proven to restrict prophylactic measures and is associated with impaired oral health status[12]. It is possible that children learn these unfavourable behaviours from their parents. As parents bear the responsibility for their preschool children's oral health, anxiety may influence parental attitudes and habits regarding the child's oral health care[13].

Maternal dental anxiety is the fear of the mother to receive dental care. It has been suggested as an indicator of child's oral health and dental use service[14]. Maternal dental anxiety is likely to be associated with dental treatment avoidance; similar to what occurs in adults, so this situation could prevent children from receiving appropriate dental care. Thus, the presence of untreated dental caries in preschool children of dentally anxious mothers reflects their negative beliefs and attitudes towards dental care[13].

Moreover, a mother's dental attendance has also been reported to influence her child's dental attendance. Regular maternal dental attendance is indicated as a positive dental health attitude which would reflect in the child's dental health and attendance[15].

Thus, maternal dental anxiety and dental attendance patterns are suggested as indicators of preschool child dental health and for taking the child to dental care, but the relationship is still unclear and need to be further explored[10].

Owing to the scarcity of literature in the Indian context, the present study aimed to assess the influence of maternal dental anxiety and attendance patterns on dental caries experience of preschool children in Mysore city, India. The hypothesis to be tested was that maternal dental anxiety and attendance pattern was associated with dental caries experience among 2-5 year old preschool children of Mysore city, India.

Materials and Methods

This analytical cross-sectional study was conducted among 2-5 year old children in preschools of Mysore city, India between July 2013 and March 2014.

Ethical considerations and approval from authorities

Prior to the commencement of the study, the research proposal was submitted to JSS University for approval. The Ethical clearance was obtained from the Institutional Ethical Committee of JSS Dental College & Hospital, Mysore. The permission to conduct the study was obtained from the Head Masters/Principals of the respective preschools

Designing the Assessment Proforma

The information on maternal dental anxiety, dental

attendance pattern and caries experience amongst the preschool children was collected using a pre-designed structured proforma. The proforma consisted of general information, assessment of maternal dental anxiety and dental attendance pattern.

General information included questions reading demographics of mothers and children, socio-economic status, oral hygiene practices and type of diet of children.

Maternal dental anxiety was assessed using Modified Dental Anxiety Scale (MDAS)[16]. MDAS is a five item questionnaire with each item having five responses. The responses are scored using a Likert scale ranging from 1 (not anxious) to 5 (extremely anxious). The total score for the scale ranged from 5 to 25[17]. Scores from 5-10 were classified as low dental anxiety, 11- 18 as moderate dental anxiety and 19 – 25 as high dental anxiety[18].

In the present study, the English version and a local Indian language (Kannada) version of MDAS was used. The Indian version of MDAS has shown good reliability and validity[17]. Its performance also proved the stability of its constructs in a clinical setting and also its applicability among the Indian populations[19]. Linguistic validation of MDAS was done as described by Acquadro *et al*[20]. The translated version was corrected with the help of the translators to eliminate any difference in the meaning between the original version and the back-translated version.

Mothers were asked about their frequency of dental visits. Maternal dental attendance pattern was assessed by four responses (1) Regular (<1year), (2) Occasional (1-5 years), (3) Emergency (only during dental problem), (4) Never.

Training and Calibration of the Investigator

The clinical examination to assess dental caries was carried out by a single examiner. The intra – examiner agreement was tested on a group of 25 preschool children twice using diagnostic criteria on successive days. The kappa statistic score (κ) obtained was 0.87 which suggested almost perfect agreement[21].

Pilot Study

A pilot study was conducted with a convenience sample of 50 mothers of preschool children to estimate the study sample and check the reliability and validity of the questionnaire. The intra class correlation coefficient was 0.89 indicating almost perfect agreement[21]. Face and content validity was assured by consultation with subject experts from the Department of Public Health Dentistry, JSS Dental College & Hospital.

Sample size estimation

Based on pilot study results, prevalence of maternal dental anxiety (p) = 44%, 95% confidence interval $Z = 1.96$, Absolute error (d) = 5%, the initial sample size was calculated as 379. Using design effect[22] (D) of 1.4 and compensating for non-respondents, the final sample size was calculated as 584.

Sample selection and recruitment of study participants

The mother child dyads were selected using stratified cluster random sampling technique. The list of aided and

unaided preschools in Mysore city was obtained from the Child Development Program Office, Mysore. According to CDPO, Mysore city was stratified into two zones – North, South. A list containing names and addresses of 80 preschools were obtained from both zones. From each zone, five preschools, two aided and three unaided were randomly selected to obtain the desired sample size, such that there was an equal representation from each of the two zones. A total of ten preschools were selected. Each preschool was considered as one cluster. All preschool children and their mothers who fulfilled the eligibility criteria and present on the day of examination were considered in this cluster.

Inclusion and Exclusion criteria

The study included all preschool children and their mothers who accompanied them on the day of examination and were willing to participate. Preschool children with neurological or systemic diseases, physical or mental disability, cleft lip and palate and using oral appliance were excluded from the study.

Informed consent

A bilingual written informed consent (English / Kannada) was obtained from the mothers after briefing them about the nature and purpose of the study.

Data Collection

In consultation with head master / principals, a prior appointment was scheduled for the study. On the appointed day, data was collected by administering questionnaire to mothers and subsequent oral examination of their preschool children. The questionnaire and clinical examination sheet were coded before administration.

Administration of questionnaire

The examiner administered the questionnaires to the mothers and any ambiguity regarding the questions was clarified by him. Kannada versions were distributed to mothers who were not well versed with English language. On an average, it took 5 minutes for a mother to answer the questionnaire. The answered questionnaires were kept separately to keep the examiner blinded.

Clinical Examination

The clinical examination of the preschool children was performed in a separate class room. All examinations were carried out by the trained and calibrated investigator and were entered into the clinical recording sheet. Dental caries was assessed using decayed, missing, filled tooth [dmf(t)] and decayed, missing, filled surface [dmf(s)] index[23]. WHO (1997) criteria was used for diagnosing dental caries[24].

After the clinical examination, the questionnaires and clinical recording sheet were attached together using the codes.

Data Analysis

Data were analysed using SPSS version 17.0. The significance level was set at $P < 0.05$. Descriptive statistics - frequencies, mean and standard deviation was used. For analysis, dmf(t) score of 0 was termed as 'caries free'. dmf(t) score > 0 was termed as 'caries

affected'. The Kolmogorov-Smirnov test was used to check the normality distribution of data. As the data was not normally distributed, non-parametric test were applied. Chi-square test was used to test the association dental caries prevalence and other variables in the study. Kruskal Wallis test was performed to compare mean dental caries score, maternal dental anxiety and maternal dental attendance. Spearman correlation test was used to study the relationship between maternal dental anxiety, maternal dental attendance and dental caries score. A binary logistic regression model was used to predict the relationship between dental caries and other variables used in the study.

Results

The final sample included 635 mother child dyads. Among 635 preschool children, 380 (59.8%) were males and 255 (40.2%) were females. Dental caries prevalence was 40.6%. Majority of the mothers felt "not anxious" in visiting dentist for treatment (56.5%), sitting in the waiting room (54.0%), having a tooth drilled (46.5%), and getting teeth cleaned and polished (40.6%). However most of the mothers felt "extremely anxious" to the use of a local anaesthetic injection (41.3%) (Table 1). 50.2% of mothers exhibited low, 39.1% of mothers exhibited moderate and 10.7% of mothers exhibited high dental anxiety. Majority (34.5%) of the mothers never visited a dentist in the present study.

The caries prevalence among preschool children in relation to age, gender, maternal dental anxiety and dental attendance is presented in (Table 2). Dental Caries was significantly associated with age and maternal dental attendance ($p < 0.001$). However, no statistical significance difference was found between maternal dental anxiety and dental caries prevalence. Maternal education level was also to be found to be significantly related to occurrence of dental caries in preschool children.

Mothers who visited dentist regularly had preschool children with lower dmf(t) score as compared to mothers who never visited dentist. This was found to be statistically significant ($p < 0.001$) (Table 4).

A negative correlation (-0.043) was found between maternal dental anxiety and maternal dental attendance score. A positive correlation was also found between maternal dental attendance score and dmf(t) score (0.064). The correlations suggested that an increase in maternal dental anxiety resulted in a decrease in maternal dental attendance score and increase in dmf(t) score.

A binary regression model was used to predict the relationship between dental caries and other variables used in the study. Dental caries was the dependent variable. The independent variables were child's age, gender, mother's age, maternal education, diet, socio-economic class, maternal dental attendance and maternal dental anxiety. The table shows that mothers with lower literacy levels were more likely to caries affected preschool children. (odds ratio = 1.068). Older preschool children were almost twice more likely to

Table 1:- Distribution of Modified Dental Anxiety Scale (MDAS) responses.

Questions	Responses					Total N (%)
	Not anxious N (%)	Slightly anxious N (%)	Fairly anxious N (%)	Very anxious N (%)	Extremely anxious N (%)	
Q1. If you were to go to your Dentist for TREATMENT TOMORROW, how would you feel?	359 (56.5)	168 (26.5)	38 (6.0)	23 (3.6)	47 (7.4)	635 (100)
Q2. If you were sitting in the WAITING ROOM (waiting for treatment), how would you feel?	343 (54.0)	173 (27.2)	39 (6.1)	32 (5.0)	48 (7.6)	635 (100)
Q3. If you were about to have a TOOTH DRILLED, how would you feel?	295 (46.5)	175 (27.6)	23 (3.6)	76 (12.0)	66 (10.4)	635 (100)
Q4. If you were about to have your TEETH CLEANED AND POLISHED, how would you feel?	258 (40.6)	191 (30.1)	47 (7.4)	85 (13.4)	54 (8.5)	635 (100)
Q5. If you were about to have a LOCAL ANAESTHETIC INJECTION in your gum, above an upper back tooth, how would you feel?	153 (24.1)	105 (16.5)	22 (3.5)	93 (14.6)	262 (41.3)	635 (100)

Table 2: Caries prevalence among preschool children in relation to age, gender, maternal dental anxiety and dental attendance

	Caries free	Caries affected	P value
Age			
2yrs	35 (9.3)	12 (4.7)	<0.001*
3yrs	89 (23.6)	26 (10.1)	
4yrs	97 (25.7)	64 (24.8)	
5yrs	156 (41.4)	156 (60.5)	
Gender			
Male	233 (61.3)	147 (38.7)	0.223
Female	144 (56.5)	111 (43.5)	
Maternal dental anxiety			
Low	196 (52.0)	123 (47.7)	0.488
Moderate	144 (38.2)	104 (40.3)	
High	37 (9.8)	31 (12.0)	
Maternal dental attendance			
Regularly	42 (11.1)	17 (6.6)	<0.001*
Occasionally	74 (19.6)	20 (7.8)	
Emergency	127 (33.7)	136 (52.7)	
Never	134 (35.5)	85 (32.9)	

*Highly significant (HS) , Chi- Square test

Table 3: Mean Dental Caries Score in relation to Maternal Dental Anxiety

Maternal Dental Anxiety	Caries score			
	d(t) (Mean±S.D.)	m(t) (Mean±S.D.)	f(t) (Mean±S.D.)	dmf(t) (Mean±S.D.)
Low	1.46±2.57	0.03±0.22	0.01±0.09	1.50±2.63
Moderate	1.73±3.21	0.03±0.22	0.03±0.30	1.80±3.29
High	2.47±4.38	0.10±0.62	0.00±0.00	2.57±4.56
Total	1.70±3.14	0.04±0.29	0.02±0.23	1.76±3.23

have dental caries than younger ones which was found to be statistically significant ($p<0.001$). Mothers from lower middle socio-economic status were thrice more likely to have caries affected children but this was not statistically significant. Mothers who never visited dentist were significantly more likely to have caries affected preschool children (odds ratio =1.69), ($p=0.008$). (Table 6).

Discussion

The present study assessed the impact of maternal dental anxiety and dental attendance pattern on caries status of their preschool children aged 2- 5 years. To our knowledge, this is the first study in the Indian context to explore the association between dental anxiety and attendance pattern of mothers and dental caries of their preschool children.

The present study reported a dental caries prevalence of 40.6% among preschool children. Similar results were obtained by Singh *et al.*[25](40%), Saravanan *et al.*[26] (44.4%) (India). A higher prevalence was found by Sarumathi *et al.*[4] (63.4%), Agarwal *et al.*[5] (56.6%) and Mahajabeen *et al.*[3](54.1%) (India). A lower prevalence was reported by Narang *et al.*[27](33.1%) (India). Caries prevalence among preschool children worldwide was reported to be 38% by Perera *et al.*[28] in Sri Lanka, 51% by Dawani *et al.*[2]in Pakistan, 69.2 % by Khan *et al.*[29]in Bangladesh, 26% by Kramer *et al.*[30]in Brazil and 11% by Wigen *et al.*[31]in Norway. The regional variations in caries prevalence may be due to differences in the socio-demographic, cultural, dietary and oral hygiene behaviour patterns of the study population.

Table 4:- Mean Dental Caries Score in relation to Maternal Dental Attendance

Maternal Dental Attendance	Caries score			
	d(t) (Mean±S.D.)	m(t) (Mean±S.D.)	f(t) (Mean±S.D.)	dmf(t) (Mean±S.D.)
Regularly	0.91±1.68	0.02±0.13	0.03±0.26	0.96±1.77
Occasionally	0.80±1.85	0.00±0.00	0.00±0.00	0.80±1.85
Emergency	2.32±3.67	0.05±0.28	0.04±3.12	2.41±3.78
Never	1.56±3.04	0.04±0.39	0.01±0.07	1.61±3.12
Total	1.70±3.14	0.04±0.29	0.02±0.23	1.76±3.23

P value - <0.001 (HS) using Kruskal Wallis test

Our study found a significant association between age of preschool children and their caries status. It was observed that dental caries prevalence among preschool children increased with increasing age. Similar results were found in Indian studies conducted by Sarumathi *et al.*[4]., Mahajabeen *et al.*[3]. An increase in caries prevalence among preschool children with increasing age may have attributed to higher caries prevalence reported by Agarwal *et al.* [5], as compared to our study. In the present study, maternal education level was found to be significantly related to occurrence of dental caries in preschool children. Dental caries prevalence was higher in preschool children whose mothers had lower literacy levels. This is in accordance to findings reported by Sarumathi *et al.*[4], Narang *et al.*[27]. This may be due to the fact that mothers with a better attitude and more knowledge will probably build up better oral health habits in their children and look after their children's oral health[4].

The main aim of the study was to determine the relationship between dental anxiety of mothers and child's caries status. So, maternal dental anxiety was assessed by Modified Dental Anxiety Scale (MDAS). The advantage of using the MDAS over Corah's scale is the translation of the response categories. The MDAS requires translating into the native language under various levels of anxiety which represents an ordinal scale, while CDAS requires a greater variety of words such as tense, anxious, relaxed and uneasy to match Corah's original categorization. The comparison between different translations also are conducted with greater confidence using the MDAS[32]. Moreover, the inclusion of local anaesthetic injection question in MDAS which is not included in CDAS, makes assessment of dental anxiety more relevant as most dental patients are fearful of injections.

maternal dental anxiety.

In the present study, mothers self-reported to experience high and moderate dental anxiety in their first visit to dentists. However, their dental anxiety decreased in subsequent dental visits.

Maternal dental anxiety was found to be significantly related to socio-economic status in our study. Mothers from low socio economic status were found to have higher prevalence of dental anxiety. Armfield *et al.*[34] also reported that adults from lower socioeconomic status are generally more fearful of dental treatment. This may be due to the fact that people from lower socio-economic backgrounds experience poorer physical health, more psychological problems and have reduced access to resources [34]. Furthermore, cultural barriers remain a strong deterrent for accessing the health care. Different cultures bring with them, a host of taboos, mores and beliefs that may hinder utilization of dental care and may lead to dental anxiety[19].

Literature reveals conflicting results about the relationship between maternal dental anxiety and dental caries experience in preschool children. In the present study, as maternal dental anxiety increased, dental caries experience of preschool children increased. However, this was not statistically significant. This may be attributed to the fact that maternal dental anxiety is associated with children's dental attendance[15]. Maternal dental anxiety blocks the provision of children's dental care which leads to their dental neglect. [33]. This ultimately results in poor dental health of the children. The results obtained were similar to study conducted by Wigen *et al.*[10] in Norway where no association was found between caries in 5 year old children and parental dental anxiety. This was in contrast to a study conducted by Goettems *et al.* [13] in

A study conducted in Brazil by Goettems *et al.*[33] using CDAS reported a higher prevalence of maternal dental anxiety compared to our study. The differences can be attributed to the dental anxiety scale used, different education level and socio-economic status of mothers who were involved in the study. No other relevant study was found in the Indian scenario to assess the prevalence of

Brazil, where a significant association was found between maternal dental anxiety and dental caries prevalence in preschool children. In the present study, the prevalence of maternal dental anxiety was low compared to Goettems *et al.* [33] which may have contributed to the variation in results. Moreover, differences in dietary factors and socio-economic backgrounds may have affected the strength of association between maternal dental anxiety and dental caries among preschool children.

Maternal dental attendance was found to be significantly related to socio-economic status in our study. The maternal dental attendance was less frequent or nonexistent amongst most of the mothers from lower socio-economic classes. Kulkarni *et al.* [35] reported that adults from lower socioeconomic status visit dentist irregularly similar to our results. This finding was similar to studies conducted by Goettems *et al.* [33] and Moimaz *et al.* [36] where 60.2% and 45.2% mothers did not visit dentist regularly.

In the present study, dental caries prevalence in preschool children was higher among mothers who had lower frequency of dental visits and was found to be statistically significant. This may be due to the fact that maternal dental attendance pattern is a predictor of children's dental attendance and dental health [15,33]. Mothers who do not prioritize their own dental attendance will not take their child for dental visits. This results in missed dental appointments and increased caries prevalence among the preschool children [10]. This is similar to a study conducted by Grembowski *et al.* [37] who found mothers with regular source of dental care to be associated with preschool children receiving more preventive services and subsequently to have lower caries prevalence. A negative correlation was found in the present study between dental caries in preschool children and maternal dental attendance. Moimaz *et al.* [36] also reported strong association between caries history of preschool children and low frequency of mothers' visits to dentists. Our study found that as maternal dental anxiety increased, the frequency of mothers' visiting dentists decreased and this was found to be statistically significant. This is in accordance with Cinar *et al.* [38] who reported that dental visit frequency was associated with dental anxiety among Turkish and Finnish mothers. A study conducted by Goettems *et al.* [39] among Brazilian women found that an increased severity of dental anxiety was associated with decreased frequency of dental visits. Eitner *et al.* [40] also found a negative association among young adult male soldiers between dental anxiety and use of dental services in adults. Various reasons can be attributed for this association. Psychological variables such as embarrassment with dental anxiety leads to avoidance of dental care. A deterioration in dental health occurs and feelings of shame and embarrassment is experienced which culminates into reinforced avoidance. Furthermore, anxiety plays a crucial role in avoidance behaviour by causing a deterioration in oral health. This

leads to an increase in the perceived likelihood of pain and restorative treatments resulting in further negative dental visiting experiences. Dental anxiety may be a component in a cycle of dental disadvantage, with dentally anxious individuals avoiding dental care and thereby worsening their problems. This increases the likelihood that subsequent dental visits will be for emergency reasons [41].

The present study showed that as maternal dental anxiety levels increased, there was an increase in mean dmft(t) score. It was also observed that mothers with high and moderate dental anxiety had visited dentists less frequently and their preschool children had higher caries prevalence as compared to mothers with low dental anxiety. This can be attributed to irregular dental visits by dentally anxious mothers as maternal dental anxiety has been strongly associated with irregular maternal dental attendance [39]. Studies [15,42] have found an association between a child's dental visits and parental visits to dentist for preventive reasons and also their caregiver's recent dental visits. It is also reported that parents who did not obtain dental care for themselves were less likely to seek dental care for their children [43]. Therefore, it is likely that a mother's negative perception or previous negative experience of dental treatment influences not only the mother's dental care use but also dental care use by the child which ultimately affects child's caries status [33].

The study is unique in the context that a first attempt has been made to throw light on the influence of maternal characteristics such as anxiety and dental attendance on caries status of their preschool children in the Indian context. Maternal dental anxiety was assessed using Modified Dental Anxiety Scale (MDAS) which has shown good reliability, validity and acceptability among Indian population. The association between maternal dental anxiety and dental attendance was assessed in the study which is novice to the existing literature. Very few studies including our study have demonstrated the effect of maternal dental anxiety, as a psychological variable on children's dental health.

However, the present study was based on cross sectional study design, so a causal relationship cannot be established. Mothers were not enquired about their first dental visit in the present study. This may have resulted in low prevalence of maternal dental anxiety as mothers self-reported to feel highly anxious on their first dental visit.

Paternal and child dental anxiety are also associated with children's dental health which were not taken into account in this study.

Conclusion

An indirect association between maternal dental anxiety and dental caries experience among preschool children may be inferred through maternal dental attendance pattern.

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