

ORIGINAL ARTICLE

The willingness to attend the first dental visit within 1 year of age: An analysis applying Andersen's behavioral model of health service utilization

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Abstract

Background: The first dental visit (FDV) within 1 year of age is important for establishing good oral health behaviors for young children, but delayed FDVs are common.

Aim: This study aimed to investigate the predisposing, enabling, and need factors of maternal willingness to attend the FDV for infants.

Design: A cross-sectional survey was conducted among mothers of infants aged 11-14 months. A questionnaire was developed based on Andersen's behavioral model of health service utilization. Data regarding the FDV, FDV willingness, and reasons for not attending the FDV were collected. Logistic regression models were used to investigate the associated factors.

Results: Of 658 infants, only 2.7% (18) had a Thirty percent (191/640) of mothers reported their willingness to attend the FDV in the next 3 months. Nearly two-thirds of mothers reported not attending the FDV since their children's teeth were healthy. Maternal perceptions of their infants' oral health status were negatively associated with willingness to undergo the FDV, whereas family social support was positively associated with willingness to undergo the FDV.

Conclusions: Need factors play a key role in the utilization of FDV. Improving parental awareness of FDV might help parents voluntarily attend the FDV, and offering support from the family and healthcare system levels enables access to paediatric dental care.

KEYWORDS

First dental visit, health service utilization, infant oral health

1 | INTRODUCTION

Oral health is an essential component of general health. Good oral health allows young children to eat and speak normally. Caries in primary teeth increases the risk of being underweight, reduce children's self-esteem, and affect oral health throughout childhood.¹ Thus, maintaining healthy primary teeth is essential for oral and overall child development.²

The first dental visit (FDV) within 1 year of age significantly impacts children's oral health.³ First, the FDV offers an assessment of the risk of developing caries to provide better oral health management for young children. Second, the FDV provides anticipatory guidance regarding oral habits, age-appropriate oral hygiene demonstrations, and diet instructions, which can motivate parents to provide the best possible oral health care for their children.⁴ Children who had the FDV within 1 year of age were more likely to use subsequent preventive services, and their average dentally related cost was nearly 40% lower than those who delayed the FDV.⁵

Despite the health and economic benefits, most infants failed to have the FDV before 1 year of age. Previous studies have shown that only 2.2% of Indian children, 2.9% of Turkish children, and 8.0% of Saudi Arabian children had their FDV within 1 year of age, and most of them had not visited a dentist until 3-6 years or even later.⁶⁻⁹ There, however, remain unanswered questions regarding the influencing factors involved with delaying the FDV. First, most studies focused on dental visit or the first time to have a dental visit, instead of recommending FDV within 1 year of age.^{10,11} Second, the retrospective study design makes it possible to recall the age and reason for the FDV, but it is difficult to collect data regarding the parents' subjective and psychological factors at that time.⁶ Third, some studies based on paediatric dental clinics only included children who had dental visits, and the situation of children who did not attend the FDV was unclear.^{7,12} Thus, a community-based study of 1-year-old infants' sample can help explore the potential influencing factors regarding the FDV within 1 year of age.

Andersen's behavioral model of health service utilization (Andersen's model) has been widely applied to explain dental care utilization behavior, which might help to explain FDV utilization behavior. According to Andersen's model, an individual's use of health services depends on predisposing, enabling, and need factors.¹³ Predisposing factors refer to factors that shape attitudes toward healthcare service use, including demographics, social structure, and health beliefs, which are related to dental visits.^{6,12,14} Income, travel, waiting times, and social support can serve as enabling factors that facilitate dental care utilization.¹⁵⁻¹⁷ Need factors refer to the amount of

Why this paper is important to paediatric dentists

- This study focused on the sample of 11-14-month-olds infants and found that most infants were delayed in first dental visit (FDV). Need factors play a key role in the willingness to attend the FDV for infants.
- The findings of this study suggest that FDV attendance can be promoted at the family and healthcare system levels.

illness perceived by individuals and serve as predictors of healthcare utilization. The association between these factors and the FDV needs to be further investigated.

Based on the current evidence, the rate of FDV within 1 year of age is low,^{6,7,9} and it might be even lower during the coronavirus disease 2019 (COVID-19) pandemic.¹⁸ Considering that behavioral willingness is an important predictor of behavior,¹⁹ this study will focus on maternal willingness to attend the FDV for 1-year-old infants. Guided by Andersen's model, this study aims to investigate the predisposing, enabling, and need factors of maternal willingness to attend the FDV within 1 year of age.

2 | MATERIALS AND METHODS

2.1 | Study sample

Data were obtained from a cross-sectional survey on infants' oral health-related behaviors, which were carried out from September to November 2020 in Beijing, China. This survey aimed to identify the factors associated with 1-year-old infants' oral health behavior, including toothbrushing, night feeding practice, and willingness to attend the FDV. The participants of this survey were mothers of 11- to 14-month-old infants. In this study, willingness to attend the FDV was the key variable. Due to the lack of data regarding the FDV in young Chinese children, willingness to attend the FDV was estimated by young children's dental visit rate in the past 12 months. The proportion of dental visits in the past 12 months was 17.4%, according to the results of the latest Chinese national oral health survey among the 3- to 5-year-old group.²⁰ With the assumption that the proportion (P) of willingness to attend the FDV is 17.4%, a significance level of 0.05, and a deviation (d) of 3.5% ($d = 0.2P$), a sample of 472 infants would be necessary to explore the association between willingness to attend the FDV and the independent variables. Based on a

previous study, the rate of FDV attendance (2.2-8.0%) was assumed to be lower than 10%. Since willingness to attend the FDV was the key outcome in this study, and those who attended the FDV would be removed from the analysis, the sample size was increased to 520.

2.2 | Data collection

A convenience sample of mothers of 11- to 14-month-old infants was included in this study since all infants should receive vaccinations at community healthcare centers (CHCs). Nineteen CHCs from urban regions in Beijing were included in this study. In each selected CHC, mothers of infants aged 11-12 months were invited to participate in this study at a community vaccination clinic, and mothers of infants aged 13-14 months were recruited by phone according to vaccination registries. A total of 687 mothers were included in the study. Twenty-nine mothers were excluded from this study due to incomplete questionnaires, and the response rate was 95.8%. Data regarding 658 participants, including 555 (84.3%) mothers of 11- to 12-month-old infants and 103 (15.7%) mothers of 13- to 14-month-old infants, were included in the final analysis.

2.3 | Variables

The theoretical framework of this study is presented in Figure 1. Both FDV attendance and willingness to attend

the FDV for infants in the following 3 months were measured, but the key outcome was the willingness to attend the FDV. Based on Andersen's model, predisposing, enabling, and need factors served as independent variables in this study.

2.4 | Behavior and willingness to attend the FDV

FDV was assessed through self-completed questions from mothers using the following questions: "has the child visited a dentist?" (yes, no). Those who answered "no" to the first question were also asked two further questions: "1. What are the reasons for not taking the child to the dentist (multiple-choice question)?" (teeth are healthy; primary teeth will fall out; lack of time; high dental cost; do not know where to get the service; hard to make an appointment; and COVID-19); and "2. Do you plan to take the child to a dentist in the next 3 months?" (yes, no).

2.5 | Predisposing factors

Demographic variables included infant sex and birth order. Maternal education was the social structural characteristic in this study and was divided into four categories: middle and high school, college, undergraduate, and graduate. Oral health beliefs were measured by oral health knowledge related to young children's dental visits

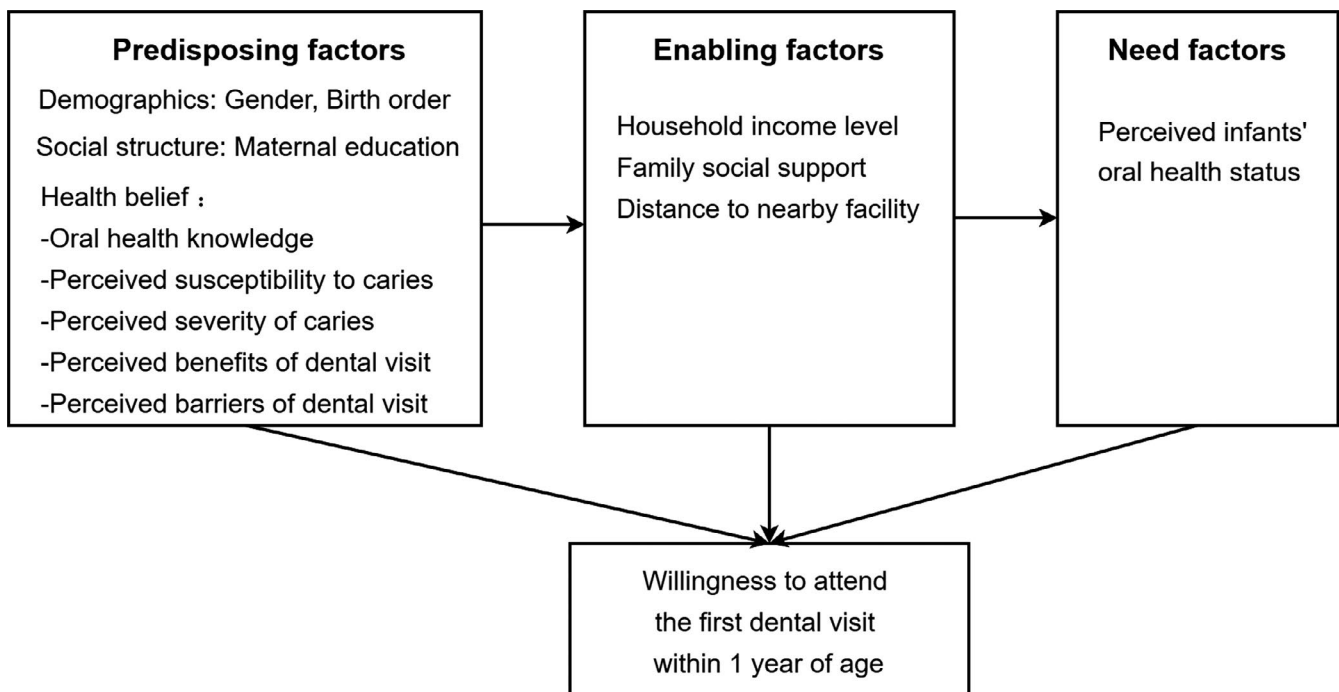


FIGURE 1 Maternal willingness to attend the first dental visit within 1 year of age: Based on Anderson's model

and components developed by the health belief model, including perceived susceptibility and severity of caries, perceived benefits, and perceived barriers to dental visits. Guided by the health belief model,²¹ these components were developed by the research team and tested by a pilot study. After a slight modification in expression, these items were used in the survey (Appendix Table A1). Cronbach's α coefficients for perceived threat (susceptibility and severity) to caries, perceived benefits, and perceived barriers to dental visit were 0.67, 0.92, and 0.75, respectively, which are acceptable.

2.6 | Enabling factors

Enabling factors included perceived household income level, family social support, and distance to nearby oral health facilities. The question about perceived household income was as follows: How do you think of your household income at the local level: upper, upper-middle, middle, lower-middle, and low. Upper and upper-middle levels were grouped into the high category, and lower-middle and low levels were grouped into the low category. Family social support was measured using the four items of the family subscale from the Multidimensional Scale of Perceived Social Support (MSPSS).²² The internal consistency reliability (Cronbach's α) for the MSPSS in the current sample was 0.94. Responses were recorded using a 5-point scale: 1 (strongly disagree), 2 (mildly disagree), 3 (neutral), 4 (mildly agree), and 5 (strongly agree). The mean score was calculated by summing the four items and dividing this result by four. Distance to nearby oral health facility was coded as 1 (<2 miles), 2 (2-5 miles), 3 (5.1-10 miles), 4 (>10 miles), and 5 (do not know).

2.7 | Need factors

Infants' oral health status was assessed by a mother-reported question: "how would you describe the condition of your child's teeth?" The five response options were excellent, very good, good, fair, and poor.²³

2.8 | Statistical analyses

Student's t-test and chi-square analyses were used to test significant differences in the demographic and health-related variables between mothers with and without a willingness to attend the FDV. Consistent with Andersen's model, three logistic regression models were used to compute odds ratios (ORs) and their 95% confidence intervals

for the willingness to attend the FDV. These models were progressively adjusted for predisposing, enabling, and need factors. Model 1 included the predisposing variables, and Model 2 added enabling factors. Finally, Model 3 added the need factor. Data were analyzed using SPSS version 23.0.

3 | RESULTS

A total of 658 mothers were included in this study. Eighteen mothers (2.74%) reported that their children attended the FDV and were excluded from the willingness analysis. Thus, 640 mothers were included in the willingness analysis.

Figure 2 shows the reasons for not attending FDVs in infants. The top three reasons are that children's teeth are healthy (61.56%), the impact of COVID-19 (21.56%), and lack of knowledge about where to obtain paediatric oral health services (13.75%).

Table 1 shows the sociodemographic and health-related characteristics of 640 mothers and infants included in the willingness analysis. The ratio of male-to-female infants was close to 1:1, and 71.09% were the first child in the family. Most mothers obtained an undergraduate or higher degree (78.75%). There were statistically significant differences in the distribution of FDV willingness among different predisposing characteristics, including different birth orders ($P = .002$), maternal oral health knowledge levels ($P = .019$), perceived susceptibility to caries ($P = .037$), and perceived severity of caries ($P = .013$). Statistically significant differences in willingness were also found among mothers with different levels of family social support ($P < .001$) and with different infants' oral health statuses ($P < .001$).

Table 2 shows the results of the regression analyses regarding maternal willingness to attend the FDV in the following 3 months. Of the sociodemographic and health belief variables representing predisposing factors in Andersen's model, only infants' birth order was associated with a willingness to attend the FDV. Mothers were more willing to take their firstborn children to an FDV than those born later (OR = 1.73, $P < .05$). Enabling factors such as family social support (OR = 1.59, $P < .01$) and household income status (OR = 3.20, $P < .05$) were significantly positively associated with willingness to attend the FDV. Mother-reported infants' oral health status was also associated with a willingness to undergo the FDV. Compared with the "fair/poor" oral health status, mothers who reported infants with "excellent" (OR = 0.27, $P < .001$) and "very good/good" oral health statuses (OR = 0.46, $P < .001$) were less willing to attend the FDV in the following 3 months.

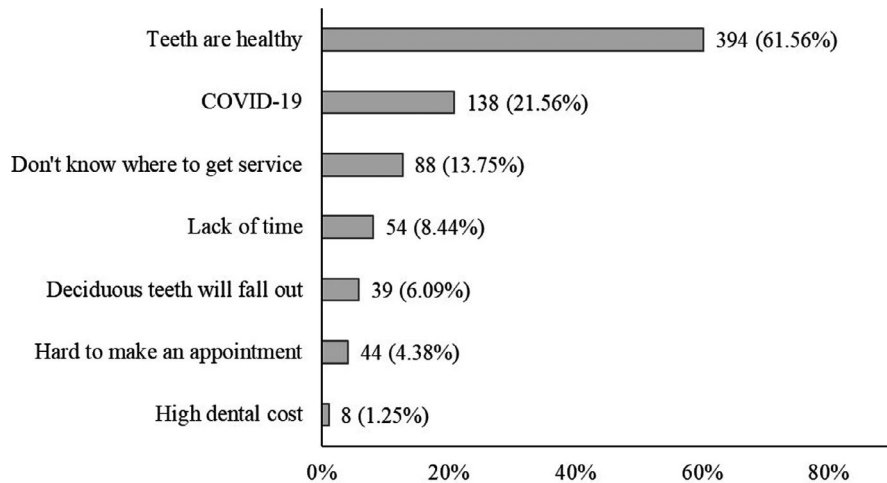


FIGURE 2 Reasons for not attending first dental visit

4 | DISCUSSION

To our knowledge, this is the first study to analyze the predisposing, enabling, and need factors that may influence the willingness to attend the FDV within 1 year of age. Our results showed that birth order in predisposing factors, family social support in enabling factors, and need factor were associated with a maternal willingness to attend the FDV for infants.

Only 2.7% of infants aged 11-14 months attended the FDV in the current sample, similar to the findings reported in Indian⁶ and Turkish children.⁹ The low rate of FDV attendance indicates that Chinese mothers also delay the FDV. Nearly 21% of mothers reported that their child failed to attend their FDV because of COVID-19, so the proportion of FDV attendance would be higher if not for the COVID-19 pandemic.¹⁸ Considering the low rates of FDV attendance and willingness to be good predictors of future healthcare utilization behavior,¹⁹ this study explored the influencing factors of maternal willingness to attend their infant's FDV.

Among the predisposing factors, only birth order was associated with a willingness to attend the FDV. Mothers were more willing to take their firstborn to their FDV than later-born children. Previous studies have shown that birth order is related to maternal and child health behaviors. For example, women are more likely to quit smoking and receive early prenatal care during their first pregnancy than during later ones, and mothers are more likely to breastfeed their firstborn child than their second-born.^{24,25} A similar relationship was also found between birth order and dental visits during adolescence.²⁶ Birth order may affect the amount of investment in children since, for many families, there are limited resources to divide among existing children, and cumulative investments (eg, healthcare expenditure) are lower for later-born children.²⁷ This mechanism, however, might not be suitable for explaining FDV among infants in Beijing, China, as

only 1.2% of mothers reported that they did not take the child to a dentist because of high dental costs, indicating that dental costs are unlikely to be a barrier for young urban parents. Therefore, limited resources within these families are unlikely to be the reason for the low willingness to attend their later-born children's FDV in current sample. Chinese families usually pay more attention to their firstborn child, and they are thus more likely to adopt the recommended behaviors or use healthcare services for this child. In addition, parents' childcare experience increases with later-born children, which might reduce their willingness to use non-essential childcare services.

Health belief components, including oral health knowledge, perceived susceptibility to caries, perceived severity of caries, and perceived benefits and barriers of dental visits, were not associated with willingness to undergo dental visits, however. Our findings were inconsistent with those of a qualitative study,⁶ which might be due to the education levels of mothers in this study. Nearly 95% of mothers in our study obtained a college degree or higher, and their oral health belief score was high and with little variation. For example, the average score of perceived caries severity was 14.23 ± 1.62 , and the average score of perceived benefits was 9.71 ± 0.92 . The high score with slight variation makes it difficult to estimate the change between different scores, thus leading to the non-significant results of the health belief components.

For enabling factors, family social support was positively associated with the willingness to attend the FDV in this study. Both emotional support and instrumental support from family members have positive effects on healthcare utilization. First, family social support is an important buffer against parenting stress,²⁸ which subsequently improves paediatric healthcare utilization.²⁹ Second, family social support can provide instrumental support (eg, information support, helping mothers make appointments, and accompanying mothers to their children's dental appointments) and help to overcome

TABLE 1 Sociodemographic and health-related characteristics (grouped by predisposing, enabling, and need factors)

	Total	Willingness to attend the FDV in the following 3 months		P
		Yes	No	
	640 (100.00%)	191 (29.94%)	449 (70.16%)	
Predisposing factors				
Gender				
Male	329 (51.41%)	101 (30.70%)	228 (69.30%)	0.627
Female	311 (48.59%)	90 (30.94%)	221 (71.06%)	
Birth order				
First child	455 (71.09%)	152 (33.41%)	303 (66.59%)	0.002 **
Non-first child	185 (28.91%)	39 (21.08%)	146 (78.92%)	
Maternal education				
Middle and high school	37 (5.78%)	10 (27.03%)	27 (72.97%)	
College	99 (15.47%)	28 (28.28%)	71 (71.72%)	0.513
Undergraduate	329 (51.41%)	93 (28.27%)	236 (71.73%)	
Graduate	175 (27.34%)	60 (34.29%)	115 (65.71%)	
Oral health knowledge	1.65 ± 0.65	1.74 ± 0.61	1.61 ± 0.66	0.019 *
Perceived susceptibility to caries	11.67 ± 1.80	11.90 ± 1.76	11.58 ± 1.81	0.037 *
Perceived severity of caries	14.23 ± 1.62	14.46 ± 1.35	14.14 ± 1.71	0.013 *
Perceived benefits of dental visit	9.71 ± 0.92	9.80 ± 0.81	9.67 ± 0.96	0.069
Perceived barriers of dental visit	8.89 ± 3.25	8.86 ± 3.16	8.90 ± 3.30	0.884
Enabling factors				
Household income status				
Low	32 (5.00%)	46 (29.87%)	108 (70.13%)	0.086
Middle	454 (70.94%)	141 (31.06%)	313 (68.94%)	
High	154 (20.06%)	4 (12.50%)	28 (87.50%)	
Family social support	4.49 ± 0.75	4.64 ± 0.62	4.42 ± 0.79	< 0.001 ***
Distance to nearby oral health facilities	3.03 ± 1.61	3.03 ± 1.57	3.03 ± 1.63	0.989
Need factors				
Self-reported oral health				
Excellent	243 (37.97%)	51 (20.99%)	192 (79.01%)	
Very good/good	285 (44.53%)	87 (30.53%)	198 (69.47%)	< 0.001 ***
Fair/poor	112 (17.50%)	53 (47.32%)	59 (52.68%)	

P* <.05; *P* <.01; and *** *P* <.001.

barriers to child dental care, thus improving access to dental care.^{30,31}

The distance to child healthcare facilities was not related to the willingness to attend the FDV in this study. Compared with other regions in China, Beijing has a

higher population density of dentists, and maternal and child healthcare institutions can offer paediatric dental care,³² which may explain why distance was not an associated factor in this study. Since the available oral healthcare resources, however, were markedly different

TABLE 2 Stepwise regression models of willingness to attend the FDV in the following 3 months (yes =1, no =0)

	Model 1	Model 2	Model 3
Predisposing Factors			
Gender (male as reference)			
Female	0.93 (0.66, 1.32)	0.94 (0.66, 1.33)	0.90 (0.63, 1.29)
Birth order (non-first child as reference)			
First child	1.89 (1.25, 2.85) **	1.90 (1.24, 2.89) **	1.73 (1.13, 2.65) *
Maternal education (middle and high school as reference)			
College	0.88 (0.37, 2.11)	0.84 (0.34, 2.05)	0.82 (0.33, 2.04)
Undergraduate	0.86 (0.39, 1.90)	0.77 (0.35, 1.73)	0.77 (0.35, 1.73)
Graduate	1.06 (0.47, 2.41)	0.95 (0.41, 2.19)	0.87 (0.37, 2.05)
Oral health knowledge	1.27 (0.94, 0.17)	1.30 (0.96, 1.70)	1.26 (0.92, 1.71)
Perceived susceptibility to caries	1.10 (0.99, 1.23)	1.10 (0.99, 1.23)	1.06 (0.95, 1.19)
Perceived severity of caries	1.06 (0.91, 1.22)	1.01 (0.88, 1.17)	1.04 (0.89, 1.21)
Perceived benefits of dental visit	1.06 (0.82, 1.36)	0.97 (0.75, 1.26)	0.91 (0.70, 1.18)
Perceived barriers of dental visit	0.99 (0.94, 1.05)	1.00 (0.94, 1.06)	0.98 (0.92, 1.04)
Enabling factors			
Household income status (low as reference)			
Middle		2.72 (0.88, 8.45)	3.08 (0.98, 9.68)
High		2.94 (0.99, 8.70)	3.20 (1.06, 9.63) *
Family social support		1.46 (1.09, 1.95) **	1.59 (1.18, 2.16) **
Distance to nearby oral health facilities		0.99 (0.89, 1.11)	0.96 (0.86, 1.08)
Need factor			
Self-reported oral health (fair/poor as reference)			
Excellent			0.27 (0.16, 0.46) ***
Very good/good			0.46 (0.28, 0.74) ***

Note: * $P < .05$; ** $P < .01$; and *** $P < .0001$.

Three models were progressively adjusted for predisposing, enabling, and need factors. Model 1 included the predisposing variables, and then Model 2 added enabling factors. Finally, Model 3 added need factor.

between regions and were greatly affected by the regional economy,^{32,33} the distance to facilities might affect the willingness to attend the FDV among populations in less-developed areas. 13.8% of mothers in this study, however, reported that they did not know where to access dental care, suggesting that information regarding paediatric oral health facilities should be more readily available to parents. In addition, 4.2% of parents reported that it was difficult to make an appointment in this study. These findings suggest that providing referrals or appointment support based on the maternal-child healthcare system might be a strategy to improve FDV attendance.³⁴

In this study, mothers' perceptions of infant oral health status were negatively associated with the willingness to attend the FDV, and nearly 60% of mothers also reported that they did not take their child to their FDV since their teeth were healthy. These findings indicate that the need

factor plays a key role in FDV attendance. In some less-developed countries, the need factor is more likely to prompt dental visits since parents often do not take their child to a dentist until dental problems arise.^{7,12,17} In this case, parents were more likely to regard the FDV as a therapeutic rather than a preventive healthcare service. The FDV, however, is more likely to be a preventative dental care service, since it offers the anticipatory guidance for young children's oral care and its goals are to motivate parents to adopt the best oral care practices, increase the utilization of preventive dental services among children and their families, prevent the onset of oral disease, and provide early intervention when needed. Therefore, it is imperative to guide parents to voluntarily use preventative dental services, not only when problems arise.

It should be noticed that the factors associated with the willingness to attend the FDV might vary across

different contexts. According to Anderson's work, voluntary dental visits are more likely to occur in Western countries, so dental care utilization was best explained by predisposing and enabling factors in this scenario.³⁵ Chinese parents, however, were more likely to regard the FDV as a treatment health service, and thus, the desire to attend the FDV was explained by need factors rather than predisposing factors. In addition, the components of health beliefs measured in this study were based on the health belief model, which is suitable for explaining behaviors related to preventative screening measures.²¹ Chinese parents, however, are more likely to regard oral health services as therapeutic rather than preventive services, which could explain the non-significant results of health belief components.

This study had several limitations. First, the participants in this study were from urban areas in Beijing and were not representative of the Chinese population. The enabling factors were greatly affected by regions and local economy,³² limiting our findings' generalizability to rural areas or less-developed regions. Second, when applying Anderson's model to explain the willingness for or behavior toward dental visits, the effect of predisposing factors may vary significantly among those from different backgrounds. Therefore, the subjects' cultural backgrounds need to be considered when applying this theory. Third, this study was conducted in China during the COVID-19 pandemic, which might have affected FDV attendance rates among infants. We failed to evaluate the effects of the COVID-19 pandemic on FDVs, but we listed COVID-19 as one possible reason for the lack of FDV attendance. Further, the primary aim of this study is to evaluate the factors associated with the willingness to attend FDVs, and the effects of COVID-19 are unlikely to change the correlation estimation.

This study provides preliminary insights into the determinants of maternal willingness to attend their child's FDV. The findings of this study indicate that actions need to be taken to improve parental awareness of FDVs and encourage them to attend the FDV voluntarily instead of waiting for the occurrence of an oral health problem. Meanwhile, offering support from the family and health system levels enables parents to more readily access paediatric dental care.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHORS' CONTRIBUTIONS

CC and ML conceived the ideas. QY contributed to study design. MZ, LY, and J.X collected data and contributed to

the Methods section. QY led the writing. CC and ML revised the manuscript. All authors gave their final approval and agreed to be accountable for all aspects of the work.

ETHICAL APPROVAL AND CONSIDERATIONS

Ethical approval for this study was obtained from the Peking University Institute Research Board (IRB00001052-19136) in 2019, and it was performed in accordance with the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards. Informed consent was obtained from all patients.

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APPENDIX

TABLE A1 The components of maternal oral health beliefs

Components	Items	Scoring range
Oral health knowledge	1. The child's teeth just erupted and are relatively healthy, so there is no need for an oral examination. (yes, no) 1. Permanent teeth could replace primary teeth, so if they are broken, they do not need treatment. (yes, no)	0-2
Perceived susceptibility to caries ^a	1. I see many children with caries in daily life. 1. My child is susceptible to caries. 1. Children are prone to caries if parents do not pay attention to oral care.	3-15
Perceived severity of caries ^a	1. Caries affects children's eating, thus affecting their growth and development. 1. Caries will cause pain in children. 1. Caries can affect other aspects of children's physical health.	3-15
Perceived benefits of dental visits ^a	1. Regular dental visits help to prevent the onset of oral diseases. 1. Timely treatment is helpful to oral health when children have caries.	2-10
Perceived barriers to dental visits ^a	1. I do not know where to access paediatric oral health services. 1. I do not have enough time to take my child to a dentist. 1. Taking children to a dentist will cost a lot of money.	3-15

^aResponses were recorded using a 5-point scale: 1—strongly disagree; 2—mildly disagree; 3—uncertain; 4—mildly agree; and 5—strongly agree.