

ORIGINAL RESEARCH

Assessment of parental knowledge and attitudes toward primary teeth

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Abstract

Background: The objective of this study was to evaluate parental knowledge and attitudes toward primary teeth, including their number, eruption times and impact on permanent teeth. Additionally, to assess parents' and caregivers' awareness of dental visits and oral hygiene. **Methods:** A cross-sectional observational study was conducted among parents and caregivers of healthy children up to 18 years old. Self-administered questionnaires were distributed online and in person using the snowball sampling strategy. The questionnaire was available in the Arabic and English languages. All parents and caregivers visiting the Dental Clinics of Taibah University were invited to participate. Those who reported not having children, individuals not residing in Madinah, and individuals who are employed in the dental field were excluded. **Results:** The *p*-value of ≤ 0.05 was set to check if the parental level of education affects results significantly. The final number of completed questionnaires was 323. Parental education was significantly associated with knowledge about primary teeth number ($p = 0.008$), attitudes towards the first dental visit ($p = 0.037$), knowledge about the frequency of annual dental visits ($p < 0.001$), whether a child should visit a dentist in the absence of pain ($p = 0.003$), and whether primary teeth are as important to clean and care for as permanent teeth ($p = 0.05$). **Conclusions:** The study reveals disparities in knowledge and attitudes towards primary dental care among parents, with mothers generally demonstrating higher understanding compared to fathers.

Keywords

Caregivers; Primary teeth; Knowledge; Attitude; Children; Parental education

1. Introduction

Primary teeth, also known as baby teeth, deciduous teeth or milk teeth are the first set of teeth that emerge in a child's mouth, consisting of twenty teeth that will eventually shed and be replaced by permanent teeth. Primary teeth include various types of teeth, such as incisors, canines and molars [1, 2].

Primary teeth serve several important functions in facilitating proper speech development, enabling children to articulate sounds and words clearly, playing a crucial role in a child's chewing and digestion, and allowing children to consume a diverse and nutritious diet. Furthermore, primary teeth act as placeholders, maintaining the space necessary for the subsequent eruption of permanent teeth and guiding their proper alignment and positioning. In addition to their functional roles, primary teeth also contribute to a child's aesthetics by providing a natural and pleasing appearance to their smile [3–6]. Therefore, preserving primary teeth is essential for maintaining the child's speech, jaw growth and mastication, building a strong foundation for healthy permanent teeth, preventing abnormal habits, and maintaining the child's overall physical, physiological and psychological health [3, 7, 8].

Parents and caregivers play a significant role in maintaining their child's oral health [2, 4, 6, 7, 9]. Their knowledge and attitudes towards primary teeth are instrumental in establishing positive oral care habits and preventing dental diseases. Surprisingly, many parents and caregivers are unaware of important milestones in dental development [2, 4, 7, 9].

Parents must be well-informed about the importance of primary teeth to effectively promote good oral hygiene practices and scheduled dental visits [10, 11]. Additionally, parents should possess the knowledge that permanent first molars, also known as "6-year molars", are not primary teeth and they will not be replaced. A common misconception exists where people have no idea that the first permanent molars typically erupt between the ages of 6 and 7 years [10–13]. This misconception can lead to a series of problems such as decay, pain, discomfort, early loss of the teeth, arch discontinuity and other unfortunate consequences resulting in the need for more advanced treatment than would have been necessary otherwise [1, 2, 10–13].

Some parents are unaware of the importance of primary teeth and tend to ignore their problems, assuming they will be replaced by permanent teeth. This lack of awareness leads

to neglect of the care of primary teeth which can have severe consequences that extend beyond childhood. Untreated dental issues, such as tooth decay and cavities, can lead to pain, infection and difficulties in eating and speaking [14, 15]. Moreover, the effects of poor oral health in primary dentition can have a lasting impact on permanent teeth, affecting their development and overall oral health [15]. Untreated decay in primary teeth can result in the spread of infection to the underlying permanent teeth, leading to potential complications and compromised oral health in the future [2, 15]. Additionally, it can lead to missed opportunities for early intervention and preventive measures to promote optimal oral health in children [2].

Parental knowledge and attitudes towards oral health greatly influence their children's oral care behaviours and long-term oral health outcomes [9]. Parents who have adequate oral health knowledge and attitudes are likely to influence their children's oral health positively. At an early age, children typically spend most of their time with their parents, particularly their mothers. Mothers' knowledge and attitude, in particular, are critical in influencing their children's oral health [4, 5, 7, 16].

A limited number of studies on parental knowledge of primary teeth have been published in Saudi Arabia. A study conducted in 2021 on parental awareness and knowledge toward their children's oral health in the city of Dammam, found that parents' perceptions of their children's oral health status in the Dammam region are generally moderate and that effective oral health programs and interventions should be carried out to increase parents' awareness of the issue [17]. In another study conducted in 2015 in the city of Abha, Aseer Region to assess parental knowledge and awareness of infant oral health, the findings indicate that Saudi parents possess enough knowledge about their children's oral health, and they also indicate the importance of oral health care education programs [16]. According to a cross-sectional study conducted in 2012 on Saudi parents' awareness and understanding of the causes of early childhood caries, it was found that parents had some level of knowledge on the subject. However, the study also revealed that this knowledge was inconsistent and sometimes contradictory [18].

As of the latest available information, it is noteworthy to mention that there are no published studies about the level of parental knowledge and attitude concerning primary teeth in Madinah, Saudi Arabia. Therefore, this study aimed to assess parental knowledge and attitude about primary teeth, including their number, eruption times and impact on permanent teeth. Also, to evaluate the awareness of parents and caregivers regarding dental visits and oral hygiene practices.

2. Materials and method

2.1 Study design, settings and participants

A cross-sectional observational study was conducted among parents and caregivers of healthy children up to 18 years of age, residing in Madinah City, Saudi Arabia. A self-administered questionnaire that was written in both Arabic and English languages was administered between 16 August and 31

October 2023. The study aimed to facilitate greater inclusivity and accessibility for participants, while also enabling them to respond in their preferred language.

Starting on 16 August 2023, two hundred and forty-six questionnaires were distributed online by using the snowball sampling strategy with a minimum number of 100 participants. The questionnaires were initially sent to parents residing in Madinah city, who were subsequently requested to share them with other parents in the region.

Commencing on 19 August 2023, all parents and caregivers, who presented at the Dental Clinics of Taibah University were invited to participate in the study. To ensure ethical standards were upheld, voluntariness and strict confidentiality for all participants were emphasized. A total of one hundred and ten questionnaires were personally distributed to eligible parents and caregivers.

Data collection was conducted by three senior dental students who had received training and instructions from an experienced pediatric dentist. The students were trained on proper protocols for approaching and interacting with study participants. This included training on how to clearly explain the written informed consent to participants, and to ensure their full comprehension. Additionally, the students were instructed on methods to assist participants in understanding the questions without providing any unintentional guidance towards the correct answers.

2.2 Inclusion and exclusion criteria

The Inclusion criteria for this study were parents and caregivers of healthy children up to 18 years of age, participants had to be residents of Madinah region.

The Exclusion criteria included those who reported not having children, individuals not residing in Madinah and individuals who are employed in the dental field.

2.3 Questionnaire development

A self-administered questionnaire was distributed both online and in person using a snowball sampling strategy. The questionnaire was available in both Arabic and English languages, and it took 10 minutes to complete. It consisted of 24 multiple-choice questions divided into five sections: Demographics (4 questions); Basic knowledge (4 questions); Awareness regarding dental visits (5 questions); and Oral hygiene practices (6 questions), as well as the importance of primary teeth (5 questions). The online questionnaire was created using Google Forms.

The questionnaire sections were as follows:

Section I consisted of 8 questions and aimed to collect general information and basic knowledge. Questions included the child's age, the caregiver's age, the educational level of the caregiver and basic knowledge topics such as the eruption and completion time of primary teeth and the significance of white spots on teeth surfaces. The online version of the questionnaire included an additional question to ensure that all participants were residents of Madinah city.

Section II included 5 questions and focused on parental awareness regarding dental visits. Questions covered several topics such as the appropriate time for the first dental visit, the

recommended number of annual dental visits, whether parents should take their child to the dentist even without pain or complaints and the role of regular dental visits in protecting primary teeth, which in turn contributes to the health of permanent teeth. The section also addressed whether dentists could identify potential complications in permanent teeth such as crowding and malalignment by examining the primary teeth.

Section III contained 6 questions and aimed to collect data on oral hygiene practices. Questions included whether teeth should be brushed at least twice daily, particularly before bedtime, the appropriate amount of toothpaste for children, the importance of fluoride in children's toothpaste, the correct behaviour of spitting out toothpaste without rinsing, when to brush teeth after meals and whether primary teeth should receive the same level of attention as permanent teeth.

Section IV consisted of 5 questions and focused on the importance of primary teeth. It explored the role of primary teeth in the health of permanent teeth and overall oral health. It addressed the consequences of neglecting primary teeth, such as premature extraction leading to malalignment, the risk of infection around the teeth, and pulp inflammation. It also emphasized that first permanent molars appear around the age of 6 to 7 years and have no replacement confirming the importance of their proper care.

2.4 Assessment of questionnaire validity and reliability

All questions were assessed to govern the representativeness of the questionnaire for the participants. The questionnaire was reviewed by a dental paediatrician to ensure the questions' accuracy. Additionally, the questionnaire was piloted amongst 10 parents who completed the questionnaire and delivered feedback to ensure the understanding and clarity of the questions.

To assess the validity of the questionnaire's content, the index of item-objective congruence (IOC) was processed for all questions. The IOC for all questions was >0.63 and was consequently considered acceptable.

The reliability of the questionnaire was assessed using Cronbach's alpha coefficient to measure internal consistency amongst multiple test items. Cronbach's alpha values ≥ 0.75 were considered good.

2.5 Data collection

Two methods were used for the data collection, online and in person.

The questionnaire was distributed by using online Google platforms. The participants were then asked to choose the most appropriate answer from a list of options provided to assess their knowledge, awareness and perceptions regarding the importance of primary teeth. The questionnaire was disseminated using a snowballing method of recruitment.

The use of online questionnaires allowed for greater accessibility and convenience for participants, while the personal distribution of surveys facilitated direct contact and ensured a higher response rate. The combination of online and in-person data collection methods allowed the study to achieve a balance between efficiency and inclusivity, while also minimizing the

potential for selection bias.

2.6 Study outcomes

The study collected demographic information from parents and caregivers, including their age, educational qualifications and the age of their child. The primary outcome of the study was to gain insights into the attitudes and level of knowledge among parents and caregivers in Madinah City. Whereas the secondary outcome was to assess the association between parental education and the level of knowledge and attitudes towards primary teeth.

2.7 Statistical analysis

Collected data were tabulated and subjected to statistical analysis using IBM-SPSS (version 25.0, Statistical Package for the Social Science, IBM Corporation, Chicago, IL, USA). Because the independent predictor of knowledge was multiple responses, a multivariate logistic regression was used with 95% reliability. The Chi-square test was used to assess the association between categorical variables, the p -value of < 0.05 was considered statistically significant.

3. Results

A total of 323 completed questionnaires from eligible participants were collected for analysis, with incomplete surveys or those with multiple responses being excluded from the study. A detailed flow diagram of the participants' demography is presented in Fig. 1.

The majority of caregivers had a university education level (55.7%), followed by those with pre-university education (33.4%) and the smallest proportion had post-graduate qualifications (10.8%). Regarding the age groups of children cared for, the largest group was children aged 5 to 11 years (42.1%), followed by children under 5 years old (35.9%) and lastly, children aged 12–18 years old (22.1%).

One hundred and thirty-six participants (42.1%) identified the total number of primary teeth as 20 (Fig. 2). Additionally, 195 participants (60.3%) identified the time frame for primary teeth eruption as 6–8 months, while 153 participants (47.3%) referred to the time frame for primary teeth completion as 2–2.5 years. The majority of participants, 249 (77.1%), attributed the appearance of white spots on tooth surfaces to reduced minerals and vitamin D.

Two hundred and five participants (63.4%) believed that the appropriate timing for the first dental visit should be based on the child's needs. Regarding the frequency of dental visits, 121 participants (37.5%) advocated for visits twice a year (Fig. 3). A majority of 191 participants (59.1%) endorsed taking children to the dentist irrespective of pain presence (Fig. 4). Moreover, 209 participants (64.7%) recognised the positive impact of regular dental visits on both permanent and primary teeth health. Additionally, 160 participants (49.5%) believed that dentists can detect potential complications in permanent teeth by examining primary teeth. Moreover, there were significant differences between participants' accurate knowledge based on the level of education as shown in Table 1.

Three hundred and seven participants (95%) recognised the

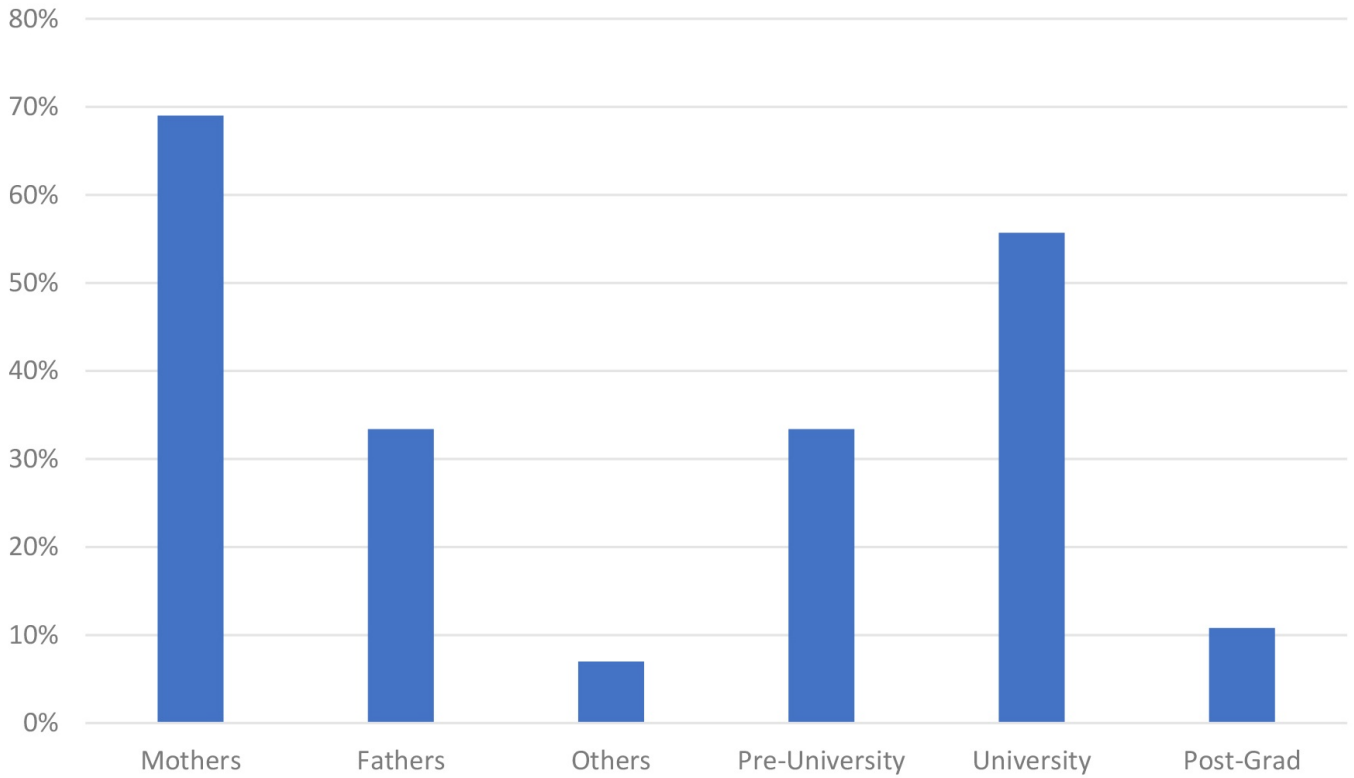


FIGURE 1. Distribution of caregivers' and their education.

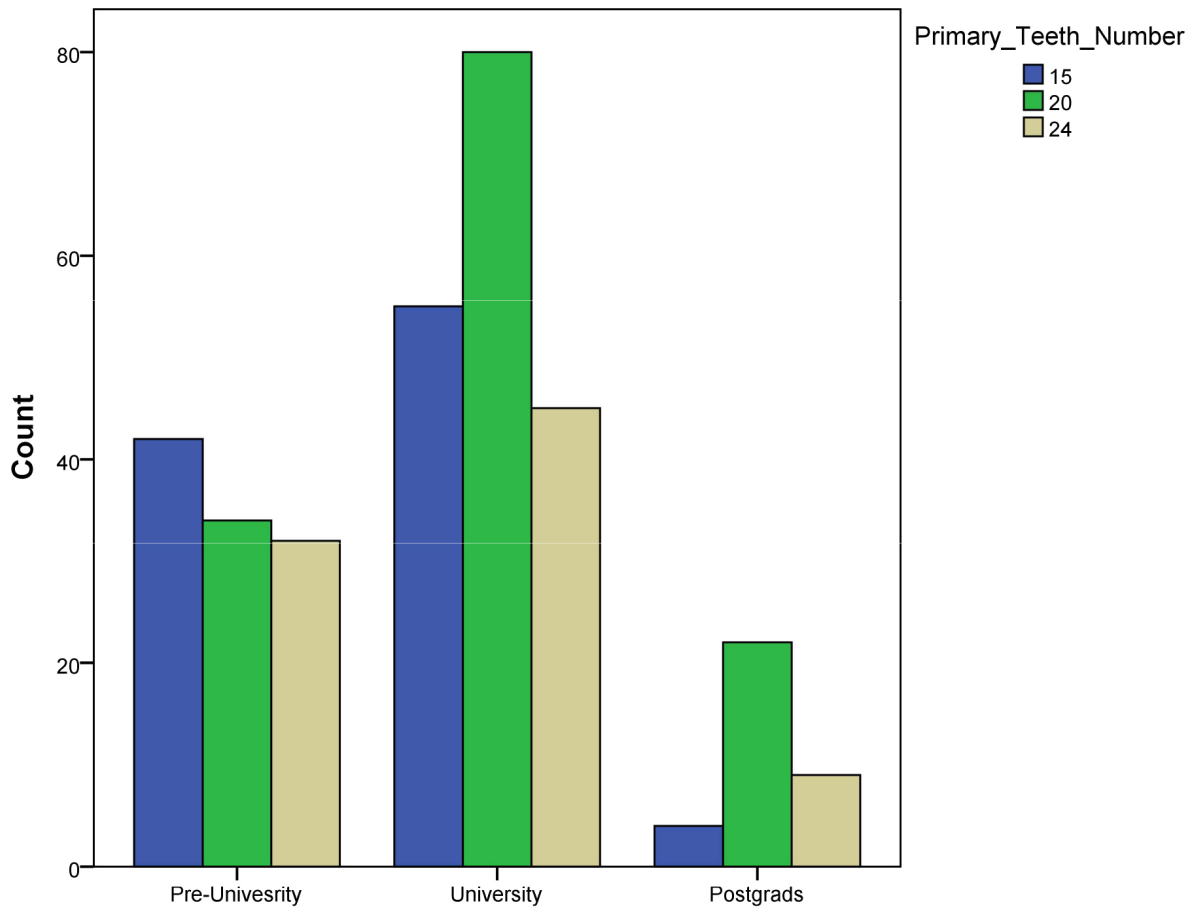


FIGURE 2. The association between parental educational levels and their knowledge about primary teeth.

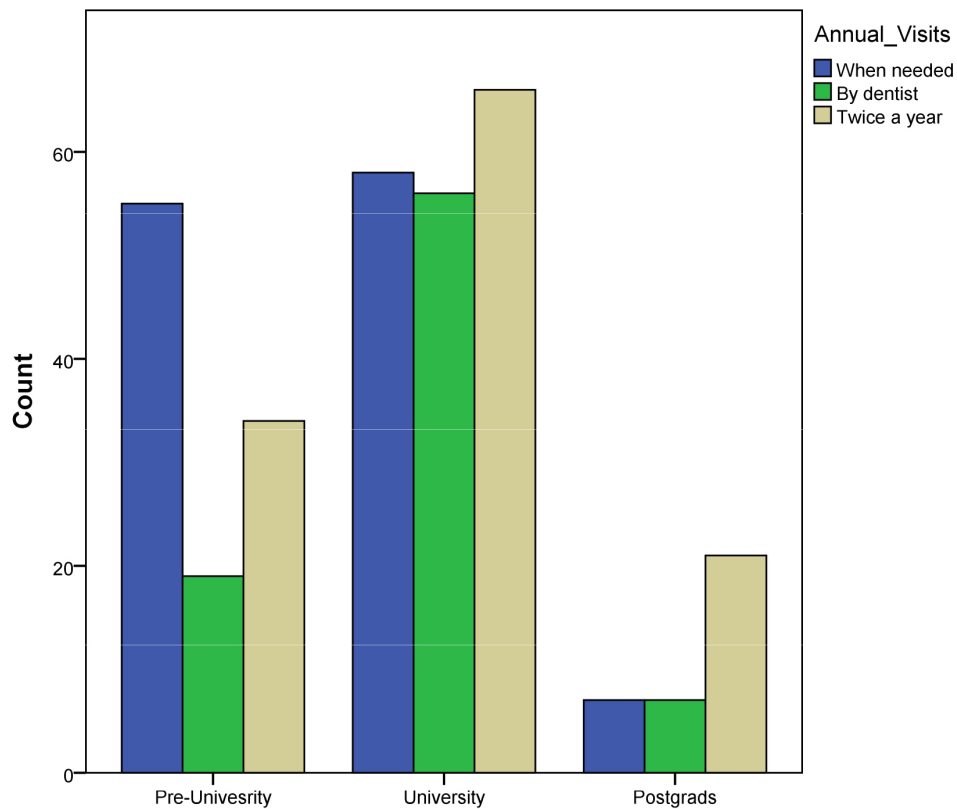


FIGURE 3. The association between parental educational levels and their knowledge about the appropriate number of dental visits per year.

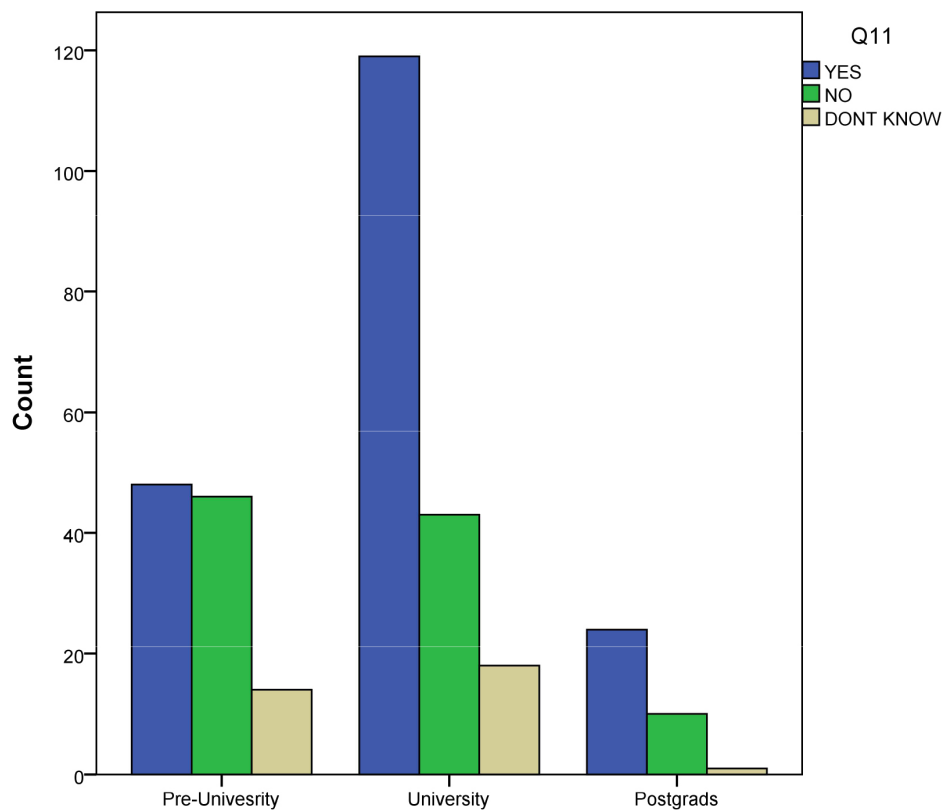


FIGURE 4. The association between parental educational levels and their knowledge about whether parents should take their child to a dentist regularly, even if the child has no pain or complaint.

TABLE 1. The correct answers of the participants based on their education level with significant *p*-value.

	Pre-university	University	postgraduate	Total	<i>p</i> -value
Total number of primary teeth	34 (31.5%)	80 (44.4%)	22 (62.9%)	136	0.008
The appropriate time for the first dental visit	25 (23.1%)	64 (35.6%)	17 (48.6%)	106	0.037
The appropriate number of dental visits per year	19 (17.6%)	56 (31.1%)	7 (20.1%)	82	<0.001
Parents should take their child to a dentist regularly, even if the child has no pain or complaint	48 (44.4%)	119 (66.1%)	24 (68.6%)	191	0.003
Primary teeth should be cleaned and cared for with the same level of attention as permanent teeth	56 (51.9%)	116 (64.4%)	27 (77.1%)	199	0.055

importance of teeth brushing at least twice daily, with one brushing session before bedtime. Regarding the appropriate amount of toothpaste, 148 participants (45.8%) advocated for using a pea-sized amount. Furthermore, 155 participants (48%) believed that children's toothpaste should contain fluoride. A large proportion, 274 participants (84.8%), understood that rinsing with water after brushing is the recommended practice. However, only 181 participants (56%) believed that brushing teeth immediately after eating is advisable. Most notably, 199 participants (61.6%) acknowledged the importance of providing primary teeth with the same level of care as permanent teeth.

One hundred ninety-nine participants (61.6%) said that primary teeth were crucial for both dental and overall health. Additionally, 187 participants (58%) understood that neglecting cavities in primary teeth can lead to premature teeth loss, which could impair teeth alignment. Furthermore, 165 participants (51.1%) acknowledged that neglecting primary teeth may result in infections that could harm permanent teeth. Moreover, 155 participants (48.1%) recognised that neglecting primary teeth could lead to pulpal inflammation and affect overall health. Interestingly, 148 participants (45.8%), do not believe that permanent molars, which appear in a child's mouth around age 6, do not have replacements and could be lost due to negligence.

4. Discussion

To the best of our knowledge, this is the first study to assess parental knowledge and attitudes regarding primary teeth in Madinah, Saudi Arabia. Generally, the results of this study demonstrated that parents and caregivers in Madinah had some degree of knowledge about primary teeth in certain aspects, this knowledge appeared to be contradictory and inconsistent.

Most of the parents who participated had negative attitudes toward primary teeth. Some of the previous studies conducted in Saudi Arabia found similar results [16–18]. In a 2021 study conducted in Riyadh, Saudi Arabia, they found that parents generally had sufficient knowledge about tooth decay and the influence of diet on tooth decay [19]. A study conducted in 2017 to assess the knowledge, attitude, and practice of Saudi parents towards their children's oral health concluded that parents had inadequate knowledge regarding the oral health of their young children [20].

In the present study, two main variables were considered upon analyzing results; to assess if there is a relationship

between the child's caregiver and his/her educational level towards their knowledge and attitudes about primary teeth.

The findings of this study indicated that those who had higher levels of education had demonstrated higher levels of knowledge in some areas and better attitudes towards primary teeth, this was also found in previous studies [10, 20, 21]. This is contradictory to the findings of another study [13]. In this study, parental education showed a significant association with their knowledge about the number of primary teeth, their attitudes towards the first dental visit, their knowledge about the frequency of annual dental visits, whether a child should be taken to the dentist in the absence of pain, and whether primary teeth are as important to clean and care for as permanent teeth.

Regarding the number of primary teeth, less than half of the participants answered correctly, which aligns with the findings of a previous study [7, 22, 23]. This suggests that there is a need to educate parents about the actual number of primary teeth. In contrast, when asked about the eruption time of primary teeth, 60.3% of the participants answered correctly, which is consistent with the findings of one study [22]. However, these results contradict the findings of another study [7]. Furthermore, only 43.3% of the participants answered correctly regarding the timing of eruption completion. This indicates a relatively low level of knowledge among parents about the time frame for primary teeth eruption. This lack of knowledge demonstrated by most participating parents emphasizes the importance of further education. When parents understand the time frame of primary teeth eruption, they can actively participate in their child's dental care, promote good oral health practices, and identify potential issues that may require professional attention. In a question regarding white spots on primary teeth, only 26 participants (8%) answered correctly.

This highlights a lack of information and education about the significance of white spots, which can be an early sign of dental caries. Parental knowledge in such situations can contribute to early interventions and prevention of further deterioration. Therefore, it is suggested that dentists provide more information and guidance to parents to improve their understanding in this regard. Only 32.8% of participants correctly identified the appropriate timing for a child's first dental visit. More than half of the participants responded with "when needed", indicating a perception that dental visits are reactive rather than preventive measures. This result suggests a lack of awareness about the importance of the first dental visit and a potential reluctance to prioritize dental care. These findings align with previous studies [5, 7, 20, 22, 24, 25] but

contradict a study conducted in Riyadh [26].

Regarding the understanding of regular dental visits, 64.7% of participants believed that visiting the dentist regularly protects primary teeth, which, in turn, protects permanent teeth. This finding supports the results of a previous study [6, 26] but contradicts another study [5]. This indicates an awareness of the importance of early interventions and prevention measures in maintaining long-term oral health. Furthermore, while 64.7% of participants believed that regular dental visits protect primary teeth, only 49.5% answered correctly regarding the dentist's ability to diagnose potential complications in permanent teeth by examining primary teeth. This suggests a discrepancy in understanding or knowledge among participants. It highlights the need for improved education and awareness regarding the connection between primary and permanent teeth and the diagnostic abilities of dentists. The disparity in responses may be attributed to limited exposure to dental information, individual misconceptions, or varying levels of education among participants. 95% of participants correctly identified the frequency of toothbrushing and the importance of brushing before bedtime. This finding is consistent with previous studies [24, 27].

The results of this study show no significant association between parental education level and their knowledge and attitudes regarding toothbrushing frequency. However, a previous study reported different results and a significant association between parental knowledge and toothbrushing frequency [10].

Regarding the appropriate amount of toothpaste, only 25.3% of participants knew that the amount should be determined based on the child's age, while 45.8% believed a pea-sized amount was appropriate. This indicates inadequate knowledge that children up to 3 years old should use only a smear of toothpaste. When asked whether toothpaste should contain fluoride, 47.9% of participants agreed, contradicting the findings of previous studies [19, 25, 28]. This indicates a need for further parental education on the benefits of fluoride. Additionally, 84.8% of participants knew that rinsing with water after brushing is the correct behaviour, while 12% answered "no", suggesting a lack of knowledge in this area.

Regarding the timing of toothbrushing after a meal, only 30.3% of participants answered correctly, while more than half believed it should be done immediately after the meal. This highlights a common misconception about the optimal timing for toothbrushing and the need for increased knowledge and awareness. In terms of dental visit frequency, only 25.3% of participants knew that annual dental visits should be determined by the dentist, while the remaining participants were divided between "when needed" and "twice a year". This uncertainty about the appropriate frequency of dental visits may stem from a lack of knowledge and awareness about personalized dental visit guidelines. However, it's worth noting that 37.4% of participants correctly answered "twice a year".

Regarding the importance of regular dental visits even in the absence of pain, 59.1% of participants answered correctly, which is consistent with previous studies [21, 27, 29]. However, these results conflict with another study [5, 28]. This discrepancy suggests that while some participants may not perceive the importance of the child's first dental visit, they

understand the need for regular follow-up visits after experiencing dental problems. When asked about the importance of cleaning and caring for primary teeth compared to permanent teeth, 61.6% of participants answered correctly. This finding is comparable to a previous study [26] but contradicts other studies [6, 7, 17]. The fact that 30% of participants did not believe that primary teeth are as important as permanent teeth indicates a need for further parental education on this matter. In a question about whether parents believe that the health of primary teeth is important for the health of permanent teeth and overall oral health, 61.6% of the participants agreed, consistent with previous studies [6, 26], but conflicting with some other studies [5, 27]. Regarding the belief that neglecting the health of primary teeth may lead to malalignment and mispositioning of permanent teeth, 57.8% of participants agreed, conflicting with previous studies [6, 17]. More than half of the participants believed that neglecting the caries of primary teeth may lead to infections around them, which harm the permanent teeth. This finding is comparable to previous studies [6, 26], but contradicting other studies [5, 27]. When asked whether neglecting caries of primary teeth may lead to pulp inflammation and infections around primary teeth, harming permanent teeth, 47.9% of participants believed it does, comparable to previous studies [6, 26] but conflicting with others [5, 27]. Regarding the fact that permanent first molars erupt at the age of 6–7 years without replacement and neglecting them can cause premature tooth loss, 45.8% of participants answered "no", while 43.6% answered "yes". This aligns with previous studies indicating inadequate parental knowledge about the timing of eruption of the first permanent molar [10–13]. Overall, mothers have demonstrated a higher level of knowledge than fathers, this is in line with previous studies [22, 26, 30]. However, this finding might be a result of the fact that the number of participating mothers in our study was significantly higher than the number of participating fathers.

Overall, the participants presented with some degree of knowledge about primary teeth in certain aspects, this knowledge appears to be contradictory and inconsistent. This may be because most of the participants were educated at the university level (180 participants), followed by pre-university degrees (108 participants), whereas only 35 participants had postgraduate degrees. The attitudes of the participants are considered negative to some level, it is either that they have the knowledge but do not act on it, or that it stems from a genuine lack of knowledge impacting their behaviour, or a tendency to select what they believe are the correct answers to showcase their perceived high level of education regarding their child's dental health.

The limitations of this study include the fact that the number of participating mothers is higher than the number of participating fathers, which limited the ability to compare their knowledge, and that the number of participants of each educational level was different, which may have affected the results of multiple questions. The use of snowball sampling might impact the results in terms of the discrepancies between the number of participating fathers and mothers. To improve results, the use of a statistically calculated sample size, and locating places where fathers could be accompanying their children are recommended for future studies. Evaluating

family income and other socioeconomic factors is important for these types of studies. Because they were not addressed in this study, evaluating these factors is recommended to be considered for future studies.

5. Conclusions

This study highlights the disparity in parental knowledge and attitudes towards primary teeth, with mothers and those with higher levels of education generally exhibiting higher levels of knowledge and better attitudes. However, the findings may be influenced by participant demographics, suggesting a need for balanced representation in future research.

AVAILABILITY OF DATA AND MATERIALS

The data are contained within this article.

AUTHOR CONTRIBUTIONS

AAN—was the main author and the supervisor of the entire research process, revised and validated the questionnaire, analyzed the data to get the results, wrote, submitted the manuscript and contributed to editorial changes in the manuscript. SS—developed the questionnaire, wrote the research introduction and discussion sections and participated in the data collection and entry. TAA and ZA—wrote the research methodology, interpreted the results and participated in the data collection and entry. All authors read and approved the final manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The protocol for this study was ethically approved by the College of Dentistry Research Ethics Committee at Taibah University (TUCDREC/050423/AAI-Namankany). All participants signed informed written consent before they participated in this study. The confidentiality of the participants was maintained by assigning an ID number for each one, instead of their names.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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