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ORIGINAL RESEARCH

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# Parental knowledge, awareness and competence about first permanent molars: their associations with clinical outcomes and oral health literacy

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## Abstract

**Background**: Permanent first molars (PFMs) are essential for children's oral development and long-term dentition, but their early eruption and high susceptibility to caries place them at risk, particularly when parental knowledge and awareness are limited. This study aimed to investigate parental knowledge, awareness, and competence regarding permanent first molars (PFMs) and their associations with children's clinical outcomes, parental oral health literacy, and behavioral factors. **Methods**: A total of 135 parent-child dyads were enrolled in this cross-sectional study. Data were collected from hospital records and an interviewer-administered questionnaire assessing parental knowledge, awareness, and competence regarding PFMs, parental oral health literacy, parent- and child-related sociodemographic characteristics, and children's oral health behaviors. Descriptive, bivariate, and multivariate analyses were performed. **Results**: Caries prevalence for each PFM ranged from 57.8% to 70.4%. The mean plaque index and gingival index values were 1.67 and 1.35, respectively. Bivariate analyses showed that parental knowledge, awareness, and competence regarding PFMs were associated with parental education level, monthly income, number of children, receiving information from the dentist about permanent first molars, plaque index (PI), gingival index (GI), and International Caries Detection and Assessment System (ICDAS) score. Having more than 8 years of education ($p = 0.002$), higher awareness scores ($p = 0.010$), higher competence scores ($p = 0.002$), and higher parental oral health literacy levels ($p < 0.001$) were identified as factors associated with parental knowledge. **Conclusions**: Parental knowledge about PFMs was limited but was associated with parental education, awareness, competence, and parental oral health literacy. Parental knowledge, awareness, and competence were also associated with children's oral health behaviors and PFM-related clinical parameters. These findings support the need for community- and clinic-based parental oral health literacy programs aimed at improving knowledge, awareness, and competence regarding PFMs and identifying parents at risk for limited oral health knowledge.

## Keywords

Permanent first molar; Gingival health; Dental caries; Parental knowledge; Oral health literacy; Oral health behaviours; Awareness; Competence

## 1. Introduction

Permanent first molars (PFMs) usually erupt between the ages 6 and 7 years and play a critical role in mastication, maintenance of vertical facial dimensions, occlusal stability, and the guidance of other permanent teeth into proper occlusion [1]. Since their eruption is asymptomatic and they occur at the back of the dental arch, many parents remain unaware of their emergence [1, 2].

PFMs are highly susceptible to caries formation because of their early eruption, deep pits and fissures, posterior position in the dental arch, inadequate oral hygiene, and cariogenic dietary habits [1, 3, 4]. At this developmental stage, children often lack the manual dexterity required for effective oral hygiene, making parental supervision essential for maintaining adequate oral hygiene [5]. However, many parents misidentify these teeth as part of the primary dentition, leading to neglect and an increased risk of dental caries [6].

Parents often seek care from a pediatric dentist only when their children experience acute pain or significant structural damage to their teeth [7]. The lack of regular dental checkups makes preventive and minimally invasive interventions difficult, leading to premature loss of PFMs and related oral health problems (*e.g.*, adjacent teeth drifting into the extraction site,

over-eruption of opposing teeth, midline deviations, irregular or unilateral masticatory patterns, and periodontal issues due to alveolar bone loss) [7, 8].

Raising parental awareness regarding the significance of PFMs is critical for ensuring children's oral health. Educating families about the importance of these teeth and their role in maintaining children's oral health is fundamental to preventing dental caries and related complications [9]. Previous research conducted in different regions of Türkiye reported a high prevalence of PFM caries and considerable treatment needs, indicating that these teeth may be lost within the first three years of the post-eruptive period due to dental caries [10]. Turkish parents had limited knowledge about PFMs and a limited ability to distinguish these teeth from primary teeth [10, 11].

Oral health literacy programs, which aim to equip parents with the skills and knowledge to make informed decisions about their children's oral health, can contribute to better oral health outcomes for their children [12, 13]. A review of the existing literature indicates that no studies that evaluated parents' knowledge, awareness, and competence regarding PFMs simultaneously. Furthermore, the terms "knowledge" and "awareness" are frequently used interchangeably in studies examining parent's levels of knowledge and awareness. However, the concept of knowledge is associated with more or less detailed and factual information, whereas awareness is associated with personally relevant information [14]. Competence is the ability to perform tasks and roles effectively by applying a combination of knowledge, skills, attitudes, and behaviors [15]. Therefore, to develop effective parental oral health literacy programs, understanding parents' levels of knowledge, awareness, and competence, as well as the factors influencing them, may help guide oral health professionals.

To the best of our knowledge, this is the first study to investigate the associations among parental oral health literacy, parental knowledge, awareness, and competence regarding PFMs, and children's oral health behaviors and clinical parameters, including International Caries Detection and Assessment System (ICDAS) scores, gingival index (GI), and plaque index (PI) values. This study aimed to assess parental knowledge, awareness, and competence regarding PFMs and to examine their associations with parental oral health literacy, children's clinical parameters, and oral health behaviors. We hypothesized that higher parental knowledge, awareness, and competence regarding PFMs would be associated with higher parental oral health literacy, more favorable oral health behaviors, and better clinical oral health outcomes in children.

## 2. Materials and methods

### 2.1 Study design, setting, and ethical considerations

This study used a cross-sectional study design and was reported in accordance with the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) Statement [16]. The study was conducted at the Department of Pediatric Dentistry, Faculty of Dentistry, Yeditepe University, between March and April 2024. Enrollment began in March 2024 after ethical approval had been obtained, and all data collection procedures, including questionnaire administration and the collection of routine clinical data from patient evaluation forms, were completed by the end of April 2024. Ethical approval was obtained from the Non-Interventional Clinical Research Institutional Review Board of Yeditepe University (Registry number: 202303Y0572). The study was conducted in accordance with the principles of the Declaration of Helsinki. The principal investigator explained the objectives of the study to all parents, and written informed consent was obtained from all parents before participation.

### 2.2 Participants, eligibility criteria, and recruitment

The sampling frame consisted of parent–child dyads who attended the Department of Pediatric Dentistry during the study period and had routine patient evaluation forms available in the hospital database. Parent–child dyads were first screened according to the child- and parent-related eligibility criteria. A simple random sampling method was then used. Eligible dyads were assigned unique identification numbers and selected using a computer-based random number generator. Selected dyads were invited to participate until the target sample size was reached. Children were included if they were aged 6–12 years, had no developmental dental anomalies or systemic disease, and had at least one erupted permanent first molar recorded in the routine patient evaluation forms. All erupted maxillary and mandibular PFMs recorded in the routine patient evaluation forms were included in the analysis. The presence of erupted PFMs and the absence of developmental dental anomalies were determined from the routine patient evaluation forms completed during routine clinical examinations and stored in the hospital database. Medical history information was also obtained from these routine patient evaluation forms. No additional clinical or radiographic examinations were performed solely for study purposes. Parents were included if they were able to read, write, and understand Turkish and agreed to participate in the study with their child. Parent–child dyads were excluded if parent declined participation for themselves or their child, or if the child's routine patient evaluation form in the hospital database was incomplete.

### 2.3 Sample size calculation

Using G*Power version 3.1 (Heinrich-Heine-Universität Düsseldorf, Düsseldorf, NRW, Germany), the minimum required sample size was calculated based on a one-tailed one-sample *t*-test, an effect size of 0.30 derived from previous studies [17–19], an alpha error probability of 0.05, and a statistical power of 0.95. The minimum required sample size was found to be 122 parent–child dyads. Considering a possible 10% non-response or incomplete-data rate, the target sample size was increased to 135 parent–child dyads.

### 2.4 Data sources and data collection

Data were obtained from two sources: routine clinical records and an interviewer-administered questionnaire. Children's clinical data were collected from the routine patient evalu-

ation forms completed during routine clinical examinations and stored in the hospital database after permission had been obtained from the hospital's clinical directorate. The informed consent form included permission for questionnaire-based data collection and for the use of children's routine patient records for research purposes. The use of children's routine clinical data for research purposes was covered by ethics committee approval and written informed consent obtained from parents.

Questionnaire data were collected by the principal investigator through face-to-face interviews with parents.

## 2.5 Clinical parameters and scoring criteria

The intraoral data were obtained from routine patient evaluation forms completed by faculty members during routine clinical examinations and stored in the hospital database. Inter-examiner agreement among faculty members for routine clinical assessments was evaluated annually using Cohen's kappa, and the coefficients consistently exceeded 0.80.

The clinical parameters collected for each erupted PFM included plaque index (PI), gingival index (GI), and ICDAS classification. PI was assessed according to the Plaque Index described by Silness and Löe [20]. The PI scoring criteria were as follows: 0, no plaque; 1, a thin film of plaque detectable by running a probe along the tooth surface; 2, moderate accumulation of soft deposits visible to the naked eye; and 3, abundant soft deposits on the tooth surface and at the gingival margin. For each child, the PI scores recorded for all erupted PFMs were averaged to obtain a mean PI value.

GI was assessed according to the Gingival Index described by Löe and Silness [20]. The GI scoring criteria were as follows: 0, normal gingiva; 1, mild inflammation without bleeding on probing; 2, moderate inflammation with bleeding on probing; and 3, severe inflammation with a tendency for spontaneous bleeding. In this study, GI scores recorded from the vestibular surfaces of all erupted PFMs were averaged to obtain a mean GI value for each child.

Dental caries classification of PFMs was performed using the International Caries Detection and Assessment System (ICDAS) [21]. For analytical purposes, PFMs with ICDAS codes 0–2 were classified as sound or having initial-stage lesions, whereas PFMs with ICDAS codes 3–6 were classified as having carious lesions. The total number of erupted PFMs classified as having carious lesions was calculated for each child and used in the correlation analyses.

## 2.6 Questionnaire-based measures

Parental oral health literacy was assessed using the Turkish version of the Rapid Estimate of Adult Literacy in Dentistry (TREALD-30) [22]. This validated tool is a word-recognition test consisting of 30 dental-related terms arranged in increasing order of difficulty based on word length, syllable count, and phonetic complexity. The items include commonly used dental terms related to oral anatomy, dental diseases, preventive care, and dental treatment. Participants were asked to read each word aloud, and one point was awarded for each correctly pronounced word. Total scores ranged from 0 to 30, with higher scores indicating higher levels of parental oral health literacy [22].

Three PFM-related scales were used to assess parental knowledge, awareness, and competence regarding PFMs: the Parental Knowledge Scale of Permanent First Molars (PKS-PFM), the Parental Awareness Scale of Permanent First Molars (PAS-PFM), and the Parental Competence Scale on Distinguishing Permanent First Molars (PCS-DPFM). These scales were developed as part of PÖE's PhD dissertation work [23], following the scale development and validation framework proposed by Boateng *et al.* [24]. The item pools were generated using both deductive and inductive approaches, including a review of existing literature and semi-structured interviews with parents. The questionnaire items used in the present study are provided in the **Supplementary material**.

Content validity was evaluated by an expert panel consisting of five pediatric dentistry experts and one public health specialist. Each item was independently assessed for relevance, clarity, and simplicity using a 4-point rating scale. The item-level content validity index (I-CVI) was calculated for each item. All retained items had I-CVI values above 0.80 for relevance, clarity, and simplicity, exceeding the minimum acceptable threshold of 0.78 [25]. The final version of the questionnaire was pretested with 28 parents to assess face validity, applicability, and understandability.

The PKS-PFM consisted of 15 items with three response options: "Yes", "No", and "I don't know". Each item was scored according to its correct answer: correct responses were scored as 1, whereas incorrect and "I don't know" responses were scored as 0. Total scores ranged from 0 to 15, with higher scores indicating greater parental knowledge about PFMs. The Kuder-Richardson Formula 20 (KR-20) coefficient for the PKS-PFM was 0.875, indicating high internal consistency.

The PAS-PFM consisted of four questions assessing parental awareness of the presence, number, caries status, and treatment need of their child's PFMs. Parents' responses were evaluated by comparing them with the corresponding clinical information recorded in each child's routine patient evaluation form. Correct answers were scored as 1, and incorrect or "I don't know" responses were scored as 0. Total scores ranged from 0 to 4, with higher scores indicating greater parental awareness. The KR-20 coefficient for the PAS-PFM was 0.62, indicating acceptable internal consistency.

The PCS-DPFM consisted of three image-based questions designed to assess parents' competence in distinguishing PFMs during the mixed dentition period. The questions evaluated parents' ability to identify permanent teeth in their child's mouth, determine the position of PFMs in the dental arch, and distinguish primary molars from permanent molars using visual aids. Correct answers were scored as 1, and incorrect or "I don't know" responses were scored as 0. Total scores ranged from 0 to 3, with higher scores indicating greater parental competence in distinguishing PFMs during the mixed dentition period. The KR-20 coefficient for the PCS-DPFM was 0.57, indicating low to moderate internal consistency.

## 2.7 Study variables

In this study, three outcome variables, namely parental knowledge, awareness, and competence scores regarding PFMs,

were assessed among the study participants.

The explanatory variables included parental sociodemographic characteristics (gender, age, educational level, employment status, number of children in the family and monthly family income), child's sociodemographic characteristics (age and gender), children's oral health behaviors (dental visiting pattern, toothbrushing frequency, and daily between-meal consumption of foods and beverages containing added sugar), parental oral health literacy, and information received from dentists about PFMs. In addition, PFM-related clinical parameters included the total number of erupted PFMs classified as having carious lesions according to ICDAS, mean plaque index (PI), and mean gingival index (GI). Fig. 1 presents the organization of the outcome variables and explanatory variables used in this study. The classification of the study variables according to type of variable is presented in Table 1.

## 2.8 Statistical analysis

Statistical analysis was performed using the IBM SPSS Statistics version 29.0 (IBM Corp., Armonk, NY, USA). Normality was assessed with the Kolmogorov-Smirnov test. Descriptive statistics were used to summarize the data, and bivariate and multivariate analyses were performed to examine associations between variables.

Internal consistency was evaluated using KR-20 (for binary scales) and Cronbach's alpha (for Likert-type scales). Group comparisons were performed using the Mann-Whitney U test for two groups and Kruskal-Wallis test for three or more groups, with the Bonferroni test for pairwise comparisons. The KR-20 values of $\geq$0.50 [26, 27] and Cronbach's $\alpha$ values of 0.60–0.70 [28] were considered acceptable thresholds. Spearman's rank correlation coefficient ($r$) was used to assess relationships for continuous variables, categorized as weak ($r \leq 0.49$), moderate ($0.50 \leq r \leq 0.74$), or strong ($r \geq 0.75$) [29]. To identify factors associated with parental knowledge about the PFMs, a backward stepwise multiple linear regression was performed with the total parental knowledge score as the dependent variable. All variables found to be significant ($p < 0.10$) in univariate analysis were included in the multiple linear regression model. The independent variables included in the regression analysis were mean PI and GI scores, the total number of PFMs classified as having carious lesions according to ICDAS, frequency of between-meal consumption of foods and beverages containing added sugar ($\leq$3 times/day *vs.* >3 times/day), number of children in the family, toothbrushing frequency ($\geq$2 times/day *vs.* <2 times/day), parental education level ($\leq$8 years *vs.* >8 years), monthly family income, TREALD-30 score, PAS-PFM score, and PCS-DPFM score. The $R^2$ statistic was used to determine the proportion of variance explained by the model, and standardized $\beta$ coefficients were calculated. The residual independence was evaluated

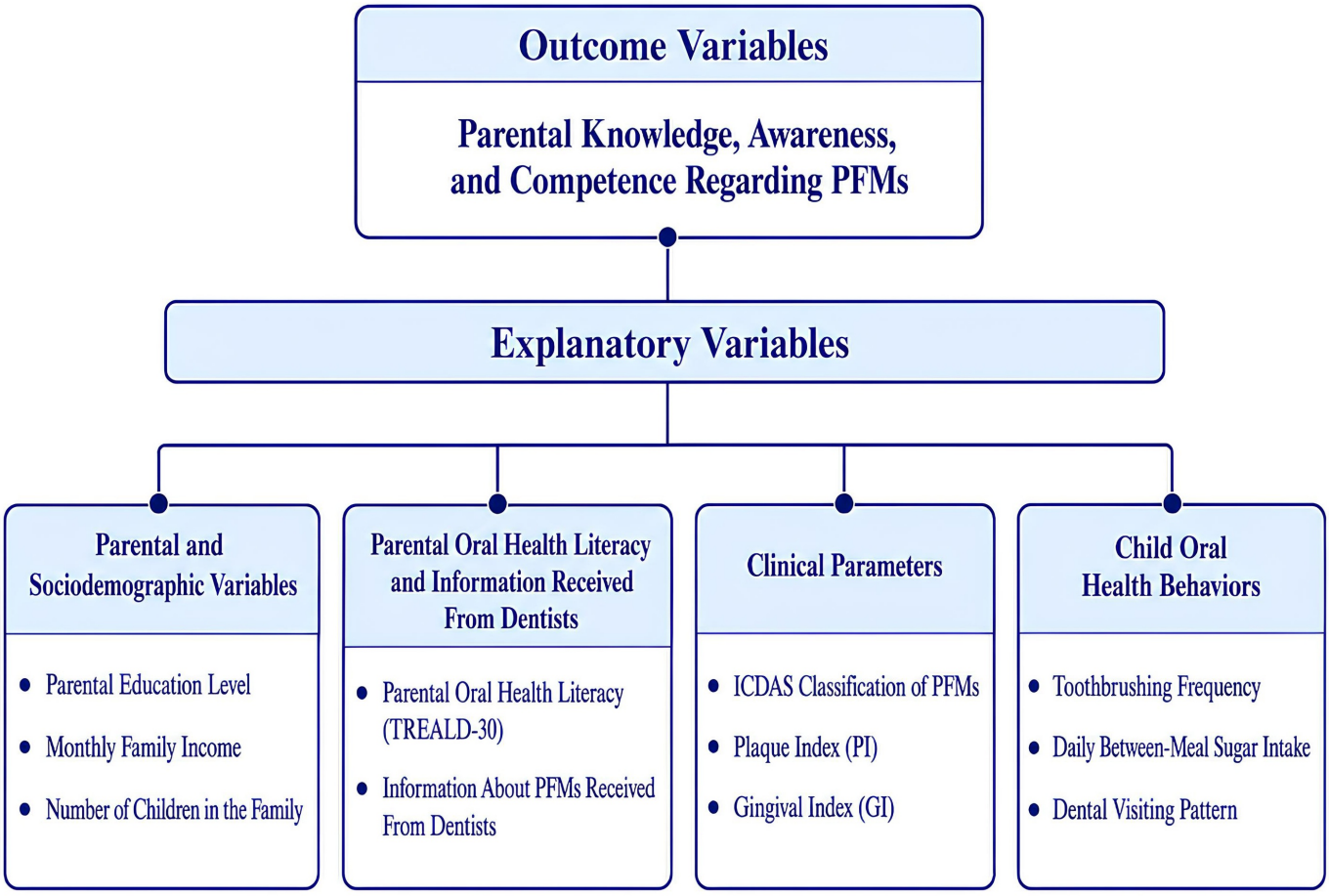



**FIGURE 1. Outcome and explanatory variables.** PFMs: Permanent first molars; TREALD-30: Turkish version of the Rapid Estimate of Adult Literacy in Dentistry; ICDAS: International Caries Detection and Assessment System.

**TABLE 1. Classification of study variables.**

| Variable group | Variables | Types of variables |
|---|---|---|
| Outcome Variables | PKS-PFM ("Yes"/"No"/"I don't know", correct answer = 1, incorrect/"I don't know" = 0)<br>PAS-PFM (correct according to clinical record = 1, incorrect/"I don't know" = 0)<br>PCS-DPFM (correct image-based response = 1, incorrect/"I don't know" = 0) | Continuous |
| Explanatory Variables | | |
| Parental oral health literacy | TREALD-30 score (1—correct pronunciation/0—incorrect pronunciation) | Continuous |
| PFM-related clinical parameters | Total number of PFMs classified as having carious lesions, mean PI, mean GI | Continuous |
| Sociodemographic variables | Parent age (in years), child age (in years), number of children in the family | Continuous |
| Sociodemographic variables | Parent gender (female/male), child gender (female/male), parental education level (≤8 years, >8 years), employment status (unemployed/employed), monthly family income (Less than minimum wage/minimum wage/more than minimum wage) | Categorical |
| Child oral health behaviors | Dental visiting pattern (yes/no), toothbrushing frequency (≥2 times/day, <2 times/day), between-meal consumption of foods and beverages containing added sugar (≤3 times/day, >3 times/day) | Categorical |
| Dental information | Information received from dentists about PFMs (yes/no) | Categorical |

*PKS-PFM: Parental Knowledge Scale of Permanent First Molars; PAS-PFM: Parental Awareness Scale of Permanent First Molars; PCS-DPFM: Parental Competence Scale on Distinguishing Permanent First Molars; TREALD-30: Turkish version of the Rapid Estimate of Adult Literacy in Dentistry; PI: plaque index; GI: gingival index; PFMs: Permanent first molars.*

using the Durbin-Watson statistic with an acceptable range of 1.5–2.5 [30]. Multicollinearity was tested based on variance inflation factors (VIF) and tolerances for individual variables. A tolerance of less than 0.20 and/or a VIF value of more than 10 indicated multicollinearity issues [31]. All statistical analyses were conducted with a significance level set at $\alpha = 0.05$.

## 3. Results

A total of 138 parent–child dyads were enrolled in the study. Three questionnaires were excluded due to incomplete responses, leaving data from 135 parent–child dyads for analysis.

### 3.1 Sociodemographic profile and oral health behaviors of the study participants

Table 2 presents the sociodemographic characteristics of the participants along with children's dietary and oral hygiene behaviors. The study sample consisted of 135 children (41.5% male, 58.5% female) with a mean age of 8.34 ± 1.84 years. Participating parents were predominantly mothers (61.5%), and the mean parental age was 38.10 ± 6.49 years. Most parents had more than eight years of education (79.3%), and the mean number of children per family was 2.00 ± 0.96. Regarding socioeconomic status, 60% of families had a monthly income above the minimum wage (>17,002.12 Turkish Lira), and 67.4% of parents were employed. Regarding children's oral health behaviors, 85.9% consumed foods or beverages containing added sugar no more than three times per day between meals, and 68.9% brushed their teeth less than two times per day.

### 3.2 Children's oral health status

The oral health status of children's PFMs was evaluated using ICDAS classification, PI, and GI. For analytical purposes, PFMs with ICDAS codes 0–2 were classified as sound or having initial-stage lesions, whereas PFMs with ICDAS codes 3–6 were classified as having carious lesions. Although the eligibility criterion required at least one erupted PFM, all children included in the study had four erupted PFMs. Therefore, ICDAS data were available for 540 PFMs from 135 children. The proportion of PFMs classified as caries lesions was 67.4% for the maxillary right PFM, 57.8% for the maxillary left PFM, 64.4% for the mandibular left PFM, and 70.4% for the mandibular right PFM. Overall, 351 of 540 PFMs were classified as caries lesions according to ICDAS.

The mean GI value of the erupted PFMs was 1.35 ± 0.67, indicating mild-to-moderate gingival inflammation on average. The mean PI value was 1.67 ± 0.99, indicating visible plaque accumulation on average. In addition, 82.2% of children required dental treatment and 52.6% required preventive care.

**TABLE 2. Sociodemographic profile and oral health behaviors of the study participants.**

| Parent & child characteristics | (n, %) |
|---|---|
| Child characteristics | |
| Child's gender | |
| Male | 56 (41.5%) |
| Female | 79 (58.5%) |
| Child's age (yr, mean ± SD) | 8.34 ± 1.84 |
| Daily toothbrushing frequency | |
| ≥2 times | 42 (31.1%) |
| <2 times | 93 (68.9%) |
| Daily between-meal frequency of sugar intake | |
| ≤3 times | 116 (85.9%) |
| >3 times | 19 (14.1%) |
| Parent characteristics | |
| Parent's gender | |
| Male | 52 (38.5%) |
| Female | 83 (61.5%) |
| Parent's age (yr, mean ± SD) | 38.10 ± 6.49 |
| Parental education level | |
| ≤8 yr | 28 (20.7%) |
| >8 yr | 107 (79.3%) |
| Number of children in the family (mean ± SD) | 2 ± 0.96 |
| [a]Monthly family income | |
| Less Than Minimum Wage | 8 (5.9%) |
| Minimum Wage | 46 (34.1%) |
| More Than Minimum Wage | 81 (60%) |
| Parental employment status | |
| Employed full-time or part-time | 91 (67.4%) |
| Unemployed | 44 (32.6%) |

[a]*The net monthly minimum wage is TRY (Turkish Lira) 17,002.12 (487 euros) in 2024. SD: Standard deviation.*

## 3.3 Parental responses to the knowledge, awareness, and competence questions regarding PFMs

Parental responses to the knowledge, awareness, and competence questions regarding PFMs are summarized in Tables 3 and 4.

Response distributions for the PFM-related knowledge items are presented in Table 3 according to the original response options ("Yes", "No", and "I don't know") to describe the parental responses to each item. For the calculation of the total PKS-PFM score, each item was scored according to its correct answer: correct responses were coded as 1, whereas incorrect responses and "I don't know" responses were coded as 0. For the awareness items presented in Table 4, parental responses concerning the presence, number, caries status, and treatment need of their child's PFMs were classified as correct or incorrect by comparing them with the corresponding clinical information recorded for each child. For the competence items presented in Table 4, responses were classified as correct or incorrect according to the correct answers to the image-based questions.

Item-level analyses of the knowledge scale showed that 55.6% of parents were aware of the coexistence of primary and permanent teeth at 6–7 years of age, 51.1% identified the posterior position of PFMs, and 56.3% recognized that early loss of PFMs may lead to irregularities in tooth alignment. However, knowledge gaps were more evident regarding eruption-related characteristics and tooth-cleaning difficulties of PFMs. Notably, 57% of parents selected "I don't know" when asked whether PFMs are the first permanent teeth to erupt, indicating substantial uncertainty about the eruption sequence of these teeth. In addition, 40% were uncertain about whether PFMs replace a primary tooth, and 45.2% reported no awareness regarding increased food accumulation during eruption. Overall, these findings suggest considerable uncertainty among parents regarding important aspects of PFM eruption and clinical significance.

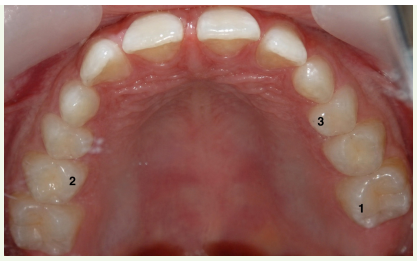
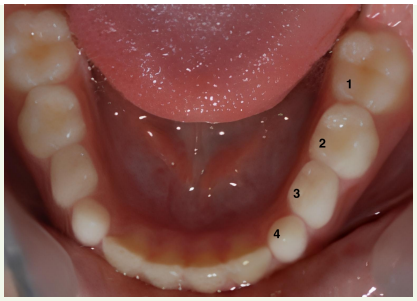
**TABLE 3. Distributions of parental responses to knowledge questions about the first permanent molar.**

| Knowledge Questions | Yes (n, %) | No (n, %) | I Don't know (n, %) |
|---|---|---|---|
| By the age of 6–7, children have both primary teeth and permanent teeth in their mouths. | 75 (55.6%) | 10 (7.4%) | 50 (37.0%) |
| The first permanent teeth to erupt in children are the first molars. | 45 (33.3%) | 13 (9.6%) | 77 (57.0%) |
| The first permanent molars replace a primary tooth. | 47 (34.8%) | 34 (25.2%) | 54 (40.0%) |
| The first permanent molars are the same size as primary molars. | 27 (20.0%) | 68 (50.4%) | 40 (29.6%) |
| The first permanent molars are more yellow in color compared to the primary molars. | 51 (37.8%) | 17 (12.6%) | 67 (49.6%) |
| The eruption time of the first permanent molars is the same in every child. | 25 (18.5%) | 58 (43.0%) | 52 (38.5%) |
| Following the shedding of the first permanent molars, a different permanent tooth will emerge in their place. | 54 (40.0%) | 42 (31.1%) | 39 (28.9%) |
| The first teeth that erupt at the back of the upper and lower jaw are the first permanent molars. | 69 (51.1%) | 11 (8.1%) | 55 (40.7%) |
| During the eruption of the first permanent molars, children may experience pain, swelling, and redness in the eruption area. | 112 (83.0%) | 4 (3.0%) | 19 (14.1%) |
| During the eruption of the permanent first molars, children might encounter symptoms such as earache, challenges in jaw movement, and elevated body temperature. | 95 (70.4%) | 12 (8.9%) | 28 (20.7%) |
| The permanent first molars ensure that the child has a healthy and properly aligned set of teeth. | 90 (66.7%) | 0 (0.0%) | 45 (33.3%) |
| During the eruption of permanent first molars, more food debris accumulates in the relevant area. | 63 (46.7%) | 11 (8.1%) | 61 (45.2%) |
| The chewing surfaces of permanent first molars, having a more indented and protruding structure, increase the accumulation of food in these areas. | 68 (50.4%) | 11 (8.1%) | 56 (41.5%) |
| Brushing the chewing surfaces of permanent first molars is easier than primary molars. | 37 (27.4%) | 49 (36.3%) | 49 (36.3%) |
| Early loss of the first permanent molars can result in irregularities in the alignment of the teeth. | 76 (56.3%) | 9 (6.7%) | 50 (37.0%) |

**TABLE 4. Distributions of parental responses to awareness and competence questions about the first permanent molar.**

| Awareness & Competence Questions | Correct (n, %) | Incorrect (n, %) |
|---|---|---|
| Awareness Questions | | |
| Does your child have a first permanent molar in their mouth? | 79 (58.5%) | 56 (41.5%) |
| How many first permanent molars does your child currently have in their mouth? | 25 (18.5%) | 110 (81.5%) |
| Does your child have caries in their first permanent molars? | 57 (42.2%) | 78 (57.8%) |
| Do you think that your child requires dental treatment for their teeth? | 53 (39.3%) | 82 (60.7%) |
| Competence Questions | | |
| Which of the numbered teeth represents a permanent tooth? | | |
|  | 68 (50.4%) | 67 (49.6%) |

**TABLE 4. Continued.**

| Awareness & Competence Questions | Correct (n, %) | Incorrect (n, %) |
|---|---|---|
| What number(s) do you think the primary molar tooth(s) are indicated by?   | 19 (14.1%) | 116 (85.9%) |
| Is there a first permanent molar tooth in the given photograph? If the answer is yes, which number indicates the permanent first molar?   | 50 (37%) | 85 (63%) |

Regarding parental awareness, 58.5% of parents recognized the presence of PFMs in their child's mouth, whereas only 18.5% were aware of the number of PFMs present. In addition, 42.2% of parents were aware of caries in their child's PFMs, and 39.3% correctly identified their child's treatment need. Parental competence was also limited, as only 50.4% correctly identified a permanent tooth in the image-based item, 14.1% identified the primary molars correctly, and 37% correctly identified the presence and position of the PFM in the provided photograph. Overall, these findings indicate substantial difficulty in recognizing and distinguishing PFMs in the child's mouth.

### 3.4 Associations among parental knowledge, competence, awareness, and oral health literacy regarding PFMs, sociodemographic variables, oral health behaviors, and clinical parameters

As shown in Table 5, no statistically significant differences were observed in parental knowledge, awareness, or competence regarding PFMs according to child age, parent age, or parent gender. Parents of girls had higher awareness scores than parents of boys ($p = 0.032$). Parental education level was significantly associated with all three domains: parents who had more than 8 years of education demonstrated higher knowledge, awareness, and competence scores (all $p < 0.001$). The number of children in the family was negatively correlated with parental knowledge, awareness, and competence ($p < 0.001$). Household income also showed a positive gradient, with families earning more than the minimum wage having higher scores across all three domains (all $p < 0.001$). Parents of children who brushed their teeth at least twice daily had significantly higher scores in all three domains (all $p < 0.001$). More frequent consumption of sugary foods and drinks between meals (>3 times/day) was also associated with significantly lower knowledge, awareness, and competence scores (all $p < 0.001$). No significant differences were found in parental knowledge, awareness, or competence scores according to whether the child had attended a dental visit in the past year ($p > 0.05$). Parents who had received information from a dentist about PFMs had significantly higher knowledge ($p = 0.017$), awareness ($p = 0.023$), and competence ($p = 0.031$) scores. TREALD-30 scores showed positive moderate correlations with parental knowledge ($r = 0.675$, $p < 0.001$), awareness ($r = 0.590$, $p < 0.001$), and competence ($r = 0.560$, $p < 0.001$).

The correlations between the clinical parameters of children's PFMs and parental knowledge, awareness, and competence are presented in Table 6. The total number of PFMs classified as caries lesions according to ICDAS showed moderate to strong negative correlations with parental knowledge ($r = -0.760$, $p < 0.001$), awareness ($r = -0.762$, $p < 0.001$) and competence ($r = -0.806$, $p < 0.001$) scores. Similarly, higher GI and PI values were associated with lower parental knowledge, awareness, and competence scores (all $p < 0.001$).

As shown in Table 7, the final regression model explained 70.7% of the variance in the total parental knowledge score (adjusted $R^2 = 0.707$, $p < 0.001$). Parental education level, awareness score, competence score, and parental oral health literacy score were identified as factors associated with parental knowledge regarding PFMs ($\beta = -0.266$, $p = 0.002$; $\beta = 0.222$, $p = 0.010$; $\beta = 0.277$, $p = 0.002$; and $\beta = 0.523$, $p < 0.001$, respectively). The Durbin-Watson statistic yielded a result of 2.011, which falls within the acceptable range of 1.5 to 2.5, indicating no evidence of autocorrelation. The VIF coefficients ranged from 2.16 to 4.00 (<10), while

**TABLE 5. Associations among parental knowledge, awareness, and competence regarding permanent first molars, sociodemographic variables, and oral health behaviors.**

| Characteristics | Knowledge (Mean ± SD) | Awareness (Mean ± SD) | Competence (Mean ± SD) |
|---|---|---|---|
| Child characteristics | | | |
| [a]Child's gender | | | |
| Male (n = 56) | 6.96 ± 4.25 | 1.32 ± 1.26 | 1.00 ± 1.06 |
| Female (n = 79) | 7.82 ± 4.37 | 1.77 ± 1.21 | 1.03 ± 0.96 |
| *p* value | 0.263 | 0.032 | 0.672 |
| [b]Child's age (yr) (*r*) | 0.037 | 0.035 | 0.092 |
| *p* value | 0.669 | 0.690 | 0.291 |
| Parental characteristics | | | |
| [b]Parent's age (yr) (*r*) | −0.045 | −0.106 | −0.059 |
| *p* value | 0.604 | 0.223 | 0.499 |
| [a]Parent's gender | | | |
| Male (n = 52) | 7.38 ± 4.20 | 1.69 ± 1.33 | 1.03 ± 0.98 |
| Female (n = 83) | 7.51 ± 4.43 | 1.51 ± 1.25 | 1.01 ± 1.01 |
| *p* value | 0.835 | 0.512 | 0.821 |
| [b]Number of children in the family (*r*) | −0.485 | −0.481 | −0.382 |
| *p* value | <0.001 | <0.001 | <0.001 |
| [a]Parental education level | | | |
| ≤8 yr (n = 28) | 4.17 ± 2.58 | 0.60 ± 0.68 | 0.39 ± 0.56 |
| >8 yr (n = 107) | 8.32 ± 4.29 | 1.84 ± 1.28 | 1.18 ± 1.02 |
| *p* value | <0.001 | <0.001 | <0.001 |
| [c]Monthly Family Income | | | |
| Less than minimum wage$^{(A)}$ (n = 8) | 4.62 ± 4.03 | 0.50 ± 1.06 | 0.37 ± 0.74 |
| Minimum wage$^{(B)}$ (n = 46) | 4.36 ± 2.56 | 0.82 ± 0.82 | 0.34 ± 0.52 |
| More than minimum wage$^{(C)}$ (n = 81) | 9.50 ± 3.97 | 2.12 ± 1.23 | 1.46 ± 0.98 |
| *p* value | <0.001 | <0.001 | <0.001 |
| **Post hoc* comparison | A *vs.* C ($p = 0.002$)<br>B *vs.* C ($p < 0.001$) | A *vs.* C ($p < 0.001$)<br>B *vs.* C ($p < 0.001$) | A *vs.* C ($p = 0.002$)<br>B *vs.* C ($p < 0.001$) |
| [a]Having dental visit in the past years | | | |
| Yes (n = 126) | 7.61 ± 4.32 | 1.61 ± 1.29 | 1.04 ± 1.01 |
| No (n = 9) | 5.44 ± 4.18 | 1.11 ± 1.05 | 0.66 ± 0.86 |
| *p* value | 0.141 | 0.276 | 0.280 |
| [a]Having a dentist's information on permanent first molars | | | |
| Yes (n = 10) | 9.89 ± 4.86 | 2.36 ± 1.60 | 1.57 ± 1.21 |
| No (n = 107) | 7.20 ± 4.11 | 1.48 ± 1.19 | 0.95 ± 0.94 |
| *p* value | 0.017 | 0.023 | 0.031 |
| [a]Frequency of tooth brushing | | | |
| ≥2 times (n = 42) | 10.73 ± 3.89 | 2.59 ± 1.32 | 1.83 ± 0.96 |
| <2 times (n = 93) | 5.98 ± 3.67 | 1.12 ± 0.96 | 0.65 ± 0.78 |
| *p* value | <0.001 | <0.001 | <0.001 |
| [a]Frequency of daily consumption of sugar added foods and beverages between meals | | | |
| ≤3 times (n = 116) | 8.04 ± 4.27 | 1.74 ± 1.29 | 1.14 ± 1.00 |
| >3 times (n = 19) | 3.94 ± 2.79 | 0.63 ± 0.68 | 0.26 ± 0.56 |
| *p* value | <0.001 | <0.001 | <0.001 |
| [b]TREALD-30 (*r*) | 0.675 | 0.590 | 0.560 |
| *p* value | <0.001 | <0.001 | <0.001 |

*[a]Mann Whitney U Test; [b]r: Spearman rank correlation coefficient; [c]Kruskal-Wallis tests; *Bonferroni's test for post hoc comparisons; $^{(A)}$: Less than minimum wage; $^{(B)}$: Minimum wage; $^{(C)}$: More than minimum wage; TREALD-30: Turkish version of the Rapid Estimate of Adult Literacy in Dentistry; SD: Standard deviation.*

**TABLE 6. Correlations between knowledge, awareness, competence scores, and clinical parameters.**

| Clinical Parameters | Knowledge | Awareness | Competence |
|---|---|---|---|
| Total Number of PFMs Classified as Caries Lesions According to ICDAS (*r*) | −0.760 | −0.762 | −0.806 |
| *p* value | <0.001 | <0.001 | <0.001 |
| GI (*r*) | −0.679 | −0.689 | −0.744 |
| *p* value | <0.001 | <0.001 | <0.001 |
| PI (*r*) | −0.717 | −0.733 | −0.764 |
| *p* value | <0.001 | <0.001 | <0.001 |

*GI: Gingival Index; PI: Plaque Index; ICDAS: International Caries Detection and Assessment System; r: Spearman rank correlation coefficient.*

**TABLE 7. Factors associated with higher parental knowledge regarding permanent first molars.**

| Variable | B | SE | $\beta$ | *p* value |
|---|---|---|---|---|
| Having more than 8 years of education[a] | −2.835 | 0.905 | −0.266 | 0.002 |
| Higher awareness level | 0.741 | 0.282 | 0.222 | 0.010 |
| Higher competence level | 1.186 | 0.370 | 0.277 | 0.002 |
| Higher parental oral health literacy | 0.474 | 0.089 | 0.523 | <0.001 |

*B: Unstandardized regression coefficient; SE: Standard error; $\beta$: Standardized regression coefficient, [a]Dichotomized variable: education was coded as 0 = >8 years and 1 = ≤8 years.*

the tolerance coefficients ranged from 0.25 to 0.46 (>0.2), confirming the absence of multicollinearity.

## 4. Discussion

National oral epidemiological studies conducted in Türkiye have shown that the prevalence of dental caries in early childhood and primary school-aged children remains above the World Health Organization's global targets, which has been linked to inadequate oral care behaviors and problem-oriented dental attendance [32–34]. Within the scope of Türkiye's 2025–2028 Health Literacy Action Plan, priority has been given to initiatives aimed at improving parents' oral health literacy [35]. Studies conducted in Türkiye have also shown that a considerable proportion of PFMs remain untreated or are extracted without prior treatment. These findings suggest that Turkish children may have delayed access to dental care and preventive interventions. Therefore, these findings support the need for community-based oral health literacy programs aimed at improving parents' knowledge of preventive care and home-based oral care practices for protecting PFMs [36, 37]. Against this background, the present study explored parental knowledge, awareness, and competence levels about PFMs and their relationships with children's clinical outcomes, parental oral health literacy, and behavioral factors.

Previous studies conducted in Türkiye have reported a considerable burden of PFM-related clinical problems, including caries-related extractions and unfavorable clinical status of first permanent molars among children and adolescents [36, 37]. Studies conducted in different populations have also reported a considerable burden of caries in PFMs, although the reported prevalence varies across populations and methodologies. Liu *et al.* [38] reported an FPM caries prevalence of 47.6% among second-grade students in China, whereas a Romanian study using the ICDAS II classification found that 57.99% of examined first permanent molars had carious lesions, fillings, or extractions, with pits and fissures being the most commonly affected surfaces [39]. Similarly, a study from Ecuador reported an FPM caries prevalence of 60.5% among children aged 8–12 years [40], while a large retrospective study from Saudi Arabia reported that 30.5% of examined FPMs were decayed [41]. In the present study, the proportion of PFMs classified as caries lesions was also high and appeared to be within the upper range of values reported across these studies. These methodological differences should be considered when interpreting comparisons across studies, including differences in age ranges, study settings, diagnostic methods, caries outcome assessment, and tooth-level or child-level reporting. PFMs are particularly susceptible to carious lesion development because of their early eruption and morphological characteristics, and may even be lost within the first three years of the post-eruptive period [42, 43].

Parents play an important role in shaping their children's oral health behaviors, supporting the development of appropriate oral hygiene habits, and facilitating access to oral health services [44, 45]. An important finding of this study was that higher levels of parental knowledge, awareness, and competence regarding PFMs were associated with more favorable eating habits, oral hygiene routines, and clinical oral health parameters in children. This finding is in line with the findings of Heydari *et al.* [9], who highlighted the potential importance of parental awareness for children's oral health outcomes.

In the present study, bivariate analyses showed that higher levels of parental knowledge, awareness, and competence re-

garding PFMs were associated with lower caries prevalence, less dental plaque accumulation, and lower gingival index scores in children's PFMs.

Unlike previous studies that primarily focused on parental knowledge and caries experience, the present study also evaluated gingival health and oral hygiene indicators [9, 11, 46]. Among children aged 6–12 years in the present sample, 57.8% had mild gingivitis and most showed plaque accumulation, indicating suboptimal gingival health and oral hygiene. In particular, the strong negative correlation between the number of PFMs classified as caries lesions and parental knowledge, awareness, and competence suggests that greater parental competence may be associated with behaviors and practices aimed at protecting children's oral health. In contrast, Vejdani *et al.* [46] reported that parental knowledge was not associated with children's caries levels, and that caries was related only to the frequency of sugary snack consumption and toothbrushing. This difference may partly reflect variations in children's age range, sample source, regional oral healthcare context, and the way caries levels and parental knowledge were assessed. Differences in access to preventive services and in the reporting of daily oral health behaviors may also contribute to inconsistent findings across studies.

Among the socio-demographic variables examined, only parental education level and monthly household income were associated with higher parental knowledge, awareness, and competence scores in this study. These findings are in line with previous studies suggesting that socio-economic status and parental education are important factors associated with PFM-related oral health outcomes [9, 47]. Families with lower income and education levels may experience difficulties in accessing regular dental care. This may be related to less attention being given to the care of PFMs and lower knowledge about these teeth. In families with limited educational and financial resources, basic needs may take priority; therefore, community-based educational initiatives and improved access to oral healthcare should be considered for these populations. Higher socioeconomic status may be associated with a greater ability to understand complex health information and with easier access to healthcare services. This interpretation is consistent with a recent study from the Western Mediterranean region of Türkiye, which reported that parental education level and toothbrushing frequency were associated with children's DMFT scores [10].

Previous studies used different questionnaires to assess parental knowledge and awareness regarding PFMs. In the present study, newly developed and pretested scales were used to assess parental knowledge, awareness, and competence in distinguishing PFMs. The PKS-PFM demonstrated high internal consistency, whereas the PAS-PFM and particularly the PCS-DPFM showed lower internal consistency coefficients and were therefore interpreted cautiously. To the best of our knowledge, this is the first study to use newly developed and pretested scales to assess parental knowledge, awareness, and competence regarding PFMs, and to examine their relationships with parental oral health literacy. The positive correlations observed among parental knowledge, awareness, competence, and oral health literacy suggest that parents with higher oral health literacy levels may be more informed and aware of their children's oral health and dentition status, highlighting the potential relevance of oral health literacy for children's oral health [12].

Parents with higher oral health literacy levels and those who had received information from a dentist about PFMs tended to have higher knowledge, awareness, and competence scores. These findings suggest that clinical encounters may provide important opportunities not only for treatment but also for structured, tooth-specific parent education about PFMs. However, 84.9% of the families who had visited a dentist reported that they had not received any information about PFMs from dental professionals. This finding is consistent with the study by Luca *et al.* [48], which similarly reported that a considerable proportion of parents had received no information about these teeth. When evaluating the impact of professional information, it is noteworthy that the competence scores of parents who received information from dentists were found to be significantly higher in this study. Similarly, Naidu *et al.* [49] reported that oral health education initiatives for parents were associated with improvements in parents' knowledge and oral health practices. These findings support the need for parental oral health literacy programs aimed at improving knowledge and awareness regarding oral care, tooth eruption, preventive treatment, nutrition, and children's oral health outcomes [17]. In clinical practice, greater emphasis should be placed on the prevention of conditions affecting PFMs, and oral health professionals should provide parents with guidance on regular dental examinations, preventive measures, and oral care aimed at preserving these teeth [4, 10, 50, 51].

However, studies evaluating the association between family size and parental knowledge and awareness regarding PFMs are limited. In the present study, a statistically significant inverse relationship was observed between the number of children in the family and parents' knowledge, awareness, and competence levels regarding PFMs. This finding may be explained in the light of the "Resource Dilution Theory" in sociology [52]. According to this theory, parental resources such as time, energy, and attention are finite, and the attention allocated to each child may decrease as the number of children increases. As the number of children increases, parental time, attention, and economic resources may be divided across children, potentially making regular dental attendance and participation in educational activities more difficult. In larger families, parents may have less opportunity to closely monitor each child's oral development, and important periods such as PFM eruption may therefore be overlooked. Therefore, larger families may represent an important target group for parental education and preventive oral health programs.

In the present study, higher levels of parental knowledge, awareness, and competence were associated with more favorable oral health behaviors. This pattern was observed in relation to both toothbrushing frequency and the consumption of sugary foods and drinks between meals. Mahboobi *et al.* [47] reported somewhat different results, showing that PFM caries incidence was not associated with snacking habits or oral hygiene status in their study [47]. This difference may partly reflect variations in follow-up duration, participant age range, caries recording criteria, and the way snacking habits and oral hygiene status were assessed. In addition, regional differences

in dietary patterns, access to preventive dental care, fluoride exposure, and parental reporting of children's daily behaviors may contribute to variability across studies. Consistent with previous studies [18, 53], less than half of the children in the present study brushed their teeth two or more times per day. In addition, 14% of the children consumed sugary foods or drinks three or more times per day, which is similar to the findings of one previous study [17] but lower than the rates reported in other studies [18, 54]. Taken together, these findings suggest that parental knowledge, awareness, and competence regarding PFMs may also be associated with children's daily oral health behaviors, supporting the importance of reinforcing oral health education for both families and children.

No significant differences were observed in parental knowledge, awareness, or competence scores according to children's dental visit history. This may indicate that having visited a dentist at least once does not necessarily translate into better parental knowledge, awareness, or competence regarding PFMs. In the present study, 6.7% of the children had never visited a dentist, whereas 93.3% had visited a dentist at least once. This finding may be related to the socio-demographic characteristics of the clinical sample. Although the proportion of children who had never visited a dentist was lower than 7.9% reported in a previous clinical study conducted in Türkiye, it still represents a noteworthy finding [55]. The American Academy of Pediatric Dentistry (AAPD) recommends that the first dental visit should take place by the age of 1 year [56]. However, dental visiting patterns among Turkish children remain largely problem-oriented [33].

In the present study, having more than 8 years of education, higher awareness and competence scores, and better parental oral health literacy were identified as factors associated with parental knowledge regarding PFMs. This finding is in line with the study by Baskaradoss *et al.* [57], which showed that literacy is significantly associated with oral health knowledge and behaviors. This association may be clinically relevant because oral health literacy may be related to how parents understand eruption-related information, preventive recommendations, and the need for timely dental care. In the context of PFMs, limited parental oral health literacy may be associated with greater difficulty in recognizing the "silent eruption" of these teeth, a higher likelihood of confusing them with primary teeth, and delayed preventive or restorative care [4, 37]. Therefore, parental education programs should emphasize the eruption timing and clinical importance of PFMs during the mixed dentition period, together with early preventive and therapeutic measures [4, 37, 45].

Regarding parental oral health knowledge about PFMs, more than half of the parents in the present study were aware that primary and permanent teeth coexist in children aged 6–7 years, that PFMs differ in size from primary molars, and that early loss of PFMs may lead to irregularities in tooth alignment. However, notable knowledge gaps were observed regarding the eruption-related characteristics and clinical identification of PFMs. Fewer than half of the parents knew that PFMs are the first permanent teeth to erupt, that eruption timing may vary, that food accumulation may occur during eruption, and that their occlusal surfaces are more difficult to clean. Most parents were also unaware of the presence, number, and treatment needs of their child's PFMs, and more than half showed limited competence in identifying PFMs in the provided image. Jaradat *et al.* [58] also reported that 82% of parents were unaware of the eruption time of the PFM, while 54% of children had at least one unsound PFM. Together with previous studies from Türkiye and other countries reporting limited parental knowledge regarding PFMs, these findings suggest the need for tailored oral health literacy and preventive programs in both clinical and community settings, with particular emphasis on eruption timing, visual recognition of PFMs, and early preventive care [10–12, 17].

This study has several limitations that should be considered when interpreting the findings. First, the cross-sectional design allows the identification of associations but does not permit causal inference or evaluation of changes over time. Therefore, the observed relationships among parental knowledge, awareness, and competence regarding PFMs, parental oral health literacy, children's oral health behaviors, and children's clinical parameters should be interpreted as associations rather than causal relationships. Second, the single-center, clinic-based sample may limit the external validity and generalizability of the findings to broader pediatric populations and parents from different socioeconomic, geographic, or health-care settings. Because participants were recruited from a pediatric dentistry clinic, they may not fully represent children and parents in the general population, including families with limited access to dental care or those who do not regularly seek dental services. Third, questionnaire-based data were self-reported by parents and may be affected by recall bias, misunderstanding of questions, misreporting, or social desirability bias. This may have influenced parental reports of children's toothbrushing frequency, between-meal sugary food and drink consumption, dental visit history, previous information received from dentists, and awareness of their child's PFMs. Therefore, findings based on parent-reported variables should be interpreted cautiously. Fourth, the internal consistency of the newly developed PFM-related scales should be considered when interpreting the findings. The PAS-PFM and PCS-DPFM showed relatively low KR-20 coefficients. The interpretation of the KR-20 depends on the purpose of the test. In general, a KR-20 of at least 0.50 is desired in exploratory studies or when creating new scales [26, 27, 59]. The PAS-PFM and PCS-DPFM were developed to assess parental awareness and competence about PFMs considering the concept of awareness and competence [14, 15]. These scales consist of a small number of items with varying degrees of difficulty. In scoring these scales, parents' subjective assessments were considered accurate after comparison with objective clinical data. Therefore, findings involving parental awareness and competence should be interpreted cautiously. Further studies with larger and more diverse samples are needed to refine these instruments and evaluate their psychometric properties more comprehensively, including test–retest reliability.

Despite these limitations, this study provides a useful basis for future research exploring parental, socio-demographic, and behavioral factors associated with PFM outcomes. Compared with many previous studies, the present study considered a

broader range of parental and socio-demographic factors. Parental oral health literacy was assessed using TREALD-30, a word-recognition instrument. Future studies using parental oral health literacy measures may be helpful to assess parental oral health literacy and its relationship with PFM-related knowledge, awareness, behaviors, and clinical outcomes, as well as to develop theory-based health education and promotion interventions aimed at improving oral health outcomes in children and identifying at-risk populations [60, 61].

The findings of this study suggest that limited parental knowledge, awareness, and competence regarding PFMs and lower parental oral health literacy may be associated with less favorable PFM-related parameters in children. These findings support the importance of family-centered preventive approaches in pediatric dentistry. Therefore, clinical approaches may benefit from focusing not only on caries treatment but also on educating parents before and during the eruption of the PFMs, within the scope of the concept of "Anticipatory Guidance" defined by the AAPD [62]. In clinical practice, this guidance may include showing parents the location of PFMs using visual aids or intraoral photographs, explaining that PFMs erupt without replacing primary teeth, emphasizing the importance of brushing newly erupted molars, and providing information about fissure sealants, fluoride applications, and regular dental visits during the mixed dentition period. Parents with lower parental oral health literacy, lower educational level, or limited awareness of their child's PFMs may benefit from simplified, repeated, and visually supported counseling. At the public health level, school- and community-based programs targeting parents of children before and during the mixed dentition period may help improve early recognition of PFMs and promote timely preventive care. In addition, increasing parental knowledge about PFMs may be considered a relevant priority within Türkiye's 2025–2028 Health Literacy Action Plan.

## 5. Conclusions

In conclusion, higher levels of parental education, awareness, competence, and parental oral health literacy were identified as factors associated with parental knowledge regarding PFMs. Parental knowledge, awareness, and competence regarding PFMs were also associated with children's oral health behaviors, including toothbrushing frequency and between-meal consumption of sugary foods and drinks, as well as with PFM-related clinical parameters. The findings of this study may provide useful insight for oral health professionals in developing community- and clinic-based parental oral health literacy programs to support families' knowledge, awareness, and competence regarding PFMs and to help identify parents at risk for limited oral health knowledge.

### ABBREVIATIONS

AAPD, American Academy of Pediatric Dentistry; B, Unstandardized regression coefficient; GI, Gingival Index; I-CVI, Item-level Content Validity Index; ICDAS, International Caries Detection and Assessment System; KR-20, Kuder-Richardson Formula 20; PAS-PFM, Parental Awareness Scale of Permanent First Molars; PCS-DPFM, Parental Competence Scale on Distinguishing Permanent First Molars; PFMs, Permanent First Molar/Permanent First Molars; PKS-PFM, Parental Knowledge Scale of Permanent First Molars; PI, Plaque Index; SD, Standard deviation; SE, Standard error; SPSS, Statistical Package for the Social Sciences; STROBE, Strengthening the Reporting of Observational Studies in Epidemiology; TREALD-30, Turkish version of the Rapid Estimate of Adult Literacy in Dentistry; TRY, Turkish Lira; $\beta$, Standardized regression coefficient; VIF, Variance Inflation Factor.

### AVAILABILITY OF DATA AND MATERIALS

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

### AUTHOR CONTRIBUTIONS

PÖE and DOO—performed the research and data collection. KP—analyzed the data. KP and PÖE—provided help and advice on the methodology and contributed to editorial changes in the manuscript. All authors designed the research study and wrote the original draft of the manuscript. All authors read and approved the final manuscript.

### ETHICS APPROVAL AND CONSENT TO PARTICIPATE

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments. The purpose and content of the study were explained to the individuals included in the study, and informed consent forms were signed. Ethical approval was obtained from the Yeditepe University Ethics Committee (Approval No: 202303Y0572, Date: 15 March 2024).

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### CONFLICT OF INTEREST

The authors declare no conflict of interest.

## SUPPLEMENTARY MATERIAL

Supplementary material associated with this article can be found, in the online version, at https://oss.jocpd.com/files/article/2095419756049776640/attachment/Supplementary%20material.pdf.

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