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ORIGINAL SCIENTIFIC ARTICLE

United Arab Emirates dentists' perceptions about the management of broken down first permanent molars and their enforced extraction in children: a questionnaire survey

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Abstract

Purpose The broken down first permanent molar (BDFPM) is common in children. Enforced extractions of first permanent molars (EExFPMs) guidelines were published in the United Kingdom (UK) in 2014. We aimed to assess the knowledge and practice of dentists in the United Arab Emirates (UAE) of BDFPMs in children in light of the guidelines.

Methods A cross-sectional sample of UAE-based dentists treating children completed a self-administered questionnaire covering; knowledge and practice of the principle of EExFPMs; to whom dentists would refer in case of BDFPMs; knowledge of the ideal age for EExFPMs (8–10 years) and finally actual awareness of the EExFPMs guidelines. Chi-square tests ($p < 0.05$).

Results A total of 199 questionnaires were completed (total return rate was 66.33%). There was no agreement on how to deal with a scenario of BDFPMs. Over 85% majority believed in saving BDFPMs rather than extracting them but 89% would consult/refer to other specialists. Whilst 51% of the participants had never carried out EExFPMs in children, 69% were aware of the EExFPMs concept and 61% knew the ideal timing of a lower FPM extraction. More than 82% were unaware of the actual UK EExFPMs guidelines. Paediatric dentists would consider EExFPMs more than other groups ($p = 0.007$).

Conclusion In the UAE dentist sample surveyed, there was a preference for preserving BDFPMs rather than extracting them in children, despite knowing when the ideal time for extraction was. Training background and specialty were influencing factors. There was a lack of awareness of the actual UK 2014 EExFPMs guidelines.

Keywords Enforced extraction · Broken down first permanent molars · Dentists · United Arab Emirates

Introduction

First permanent molars (FPMs) are the first permanent multi cusped teeth to erupt in the oral cavity at around 6 years of age, thereby making these teeth more susceptible to dental caries (Gill et al. 2001; Pitts et al. 2006; Skeie et al. 2006; Wuollet et al. 2018). They represent the cornerstone of establishing the permanent occlusion; therefore, their importance in the development of the dentition is never underestimated. Aside from dental caries, the occurrence of chronological and non-chronological enamel defects leads FMPs to hypomineralisation and hypoplasia (Jalevik and Noren 2000) and specifically Molar Incisor Hypomineralisation or MIH- (Weerheijm 2004), a very prevalent condition worldwide (Zhao et al. 2018). This can lead to broken down first permanent molars or BDFPMs (See Fig. 1), a problem that generates—till date—the interest of dentists dealing with children (Taylor et al. 2019). Managing the BDFPM can be challenging in young children due to cooperation issues, with a wide range of treatments available. These range from simple restorations, to root canal treatments, crowning or even multiple extractions (Lygidakis et al. 2010), of which if carried out in young children could induce dental anxiety lasting into adulthood (Jälevik and Klingberg 2002, 2012; McDonnell-Boudra et al. 2014) further complicating matters. The issue of removal of BDFPMs as an elective procedure, or what is known as the "Enforced Extractions of First Permanent Molars", or EExFPMs is a recently developed

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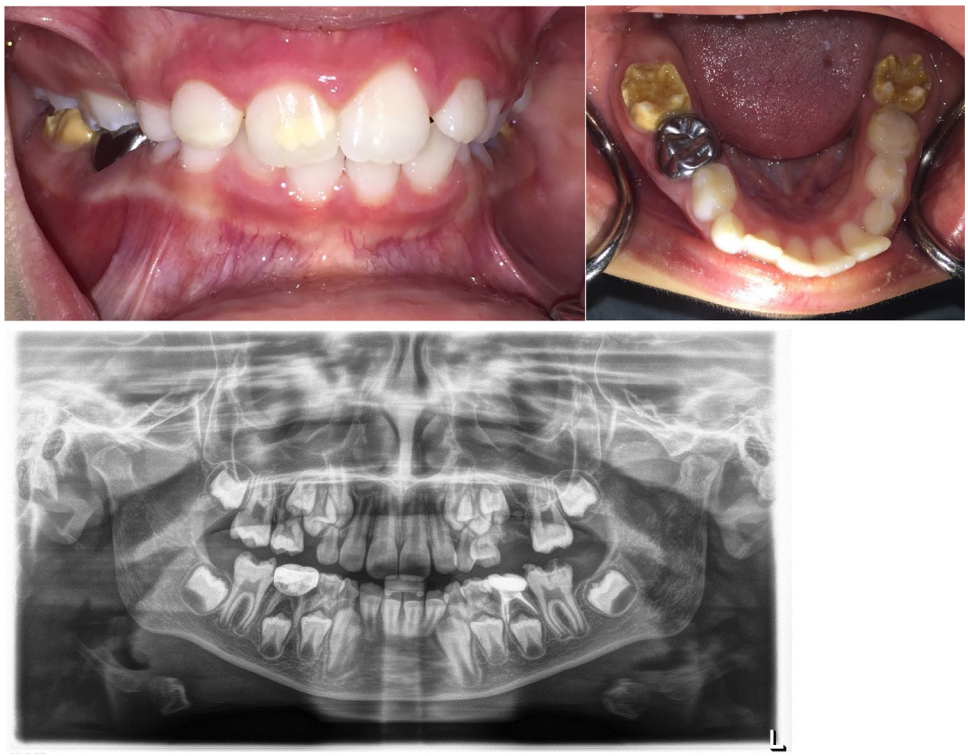

Fig. 1 Broken down first permanent molars (BDFPM) due to molar incisor hypomineralisation (MIH) in a child patient. These images and radiograph were used as the scenario of question 1 of the survey

concept (Cobourne et al. 2014). EExFPMs does not represent all schools of thought in dentistry. The procedure has its supporters (Schroeder et al. 2011; Cobourne et al. 2014; ElSheikh and Ali 2015; Travess et al. 2004; Saber et al. 2018) and is advocated by the Royal College of Surgeons of England in the United Kingdom (UK) (RCSEng 2014). In contrast, a search of the American Academy of Pediatric Dentistry (AAPD) guidelines website (AAPD 2019), suggested that EExFPMs is unrecognised as a clinical concept although major American textbooks allude to it (McDonald et al. 2011). Generally, the extraction of FPMs are very rarely the teeth of choice for orthodontic reasons—in practice, as their removal often makes treatment more difficult (Welbury et al. 2018) and even if pulpally compromised, there are those who advocate saving them (El Meligy et al. 2016; AAPD 2016). In addition, if extractions take place, there is confusion among clinicians (Innes et al. 2013; Kopperud et al. 2016) to whether a 'compensating extraction' (i.e., extraction of the opposing FPM to prevent it over erupting) or a 'balancing extraction' (i.e., extraction of the contralateral FPM to establish symmetry) is necessary although the guidelines recommend this in certain instances (RCSEng 2014). Therefore, to avoid inappropriate and unnecessary dental extractions, it is important to consider whether EExFPMs are in the best interest of the child, particularly when the children or parents refuse to accept the extractions required to achieve optimal long-term oral health.

Regardless of the method of treatment, a full developing dentition assessment should be performed (Cobourne et al. 2014). In addition, there is a need to take into account various factors such as the child's age, cooperation, parental attitudes, etc. (Albadri et al. 2007; Jälevik and Möller 2007) prior to treatment of BDFPMs that may or may not include their extraction, in addition to consulting appropriate specialists such as an orthodontist or paediatric dentist (Cobourne et al. 2014). While dental caries is rampant in the United Arab Emirates (UAE) (AlBluwi 2014; AlAyyan et al. 2017; AlSalami et al. 2018), and with a high prevalence of MIH (Hussain et al. 2018), the BDFPM represents a real problem in this region. To the authors' knowledge, the management of the BDFPM by dentists practicing in the UAE had previously been unaddressed. Our study aimed to assess dentists' management of BDFPMs in children, to highlight a referral pattern if any and to assess the knowledge and practice of BDFPMs extraction in light of the EExFPMs 2014 guidelines.

Materials and methods

This study is a cross-sectional survey. Data were collected by means of a paper questionnaire, by the principle investigator (MD), by surveying dentists licensed in the UAE who treated children regardless of their specialty. The UAE has four separate health authorities. To access as many UAE

dentists as possible, due to the lack of a UAE central dentist registry, the questionnaires were distributed to UAE dentists participating in the largest annual dental event in Middle East and North Africa Region (MENA). Thus, the likelihood for a large turnout of UAE dentists was considered very high as highlighted by a similar study (AlHajeri et al. 2018). The questionnaire was piloted amongst five general dental practitioners (GDPs) and five specialists in paediatric dentistry (PDs) for feasibility and readability and feedback was sought by a statistician to ensure that questions were valid and easy to understand could be completed within a reasonable time. The sample size was calculated based on the probability of having knowledge about EExFPMs equal to 10% and using the formula of Cochran's sample size calculation for cross-sectional design. The calculation yielded a sample size of 138 and adding 20% of nonresponse the size was determined to be 166 participants. A total of 300 paper questionnaires were distributed at the aforementioned event. Inclusion criteria were UAE registered dentists who treated or were currently treating children. Exclusion criteria were non-UAE dentists, and dentists not treating children. The collected data from the questionnaires were transferred to computer-spread sheets and analysed using computerized Statistical Package for Social Sciences (SPSS, version 20, Chicago, SPSS Inc). Descriptive statistics were performed for the general description of the data. Chi-square and Fisher's Exact test were performed to examine differences between categorical data and *t* test was performed to compare continuous variable. A p value of <0.05 was considered significant in all statistical analysis. This study was conducted in full conformance with principles of the "Declaration of Helsinki", Good Clinical Practice (GCP), and within the laws and regulations of the UAE/Dubai Healthcare Authority (DHCA). The ethical approval obtained from the Research Ethics Review Committee in Mohammed Bin Rashid University of Medicine and Health Science (MBRU). The questions in the survey were grouped into two groups: (a) Broken down first permanent molars (BDFPMs) management options, practice and knowledge (Q1, Q2, Q3, Q4); and (b) Enforced extraction of first permanent molars guidelines' (EExFPMs) knowledge/ awareness (Q5, 6, 7, 8 and 9). See Tables 2, 3 and Fig. 2.

Results

300 dentists who work in the UAE were targeted via a direct paper survey. Out of the distributed surveys there were 199 completed responses that were returned (total return rate was 66.33%) exceeding the aforementioned power calculation. None of the completed surveys were excluded. The participants were dentists representative of different educational

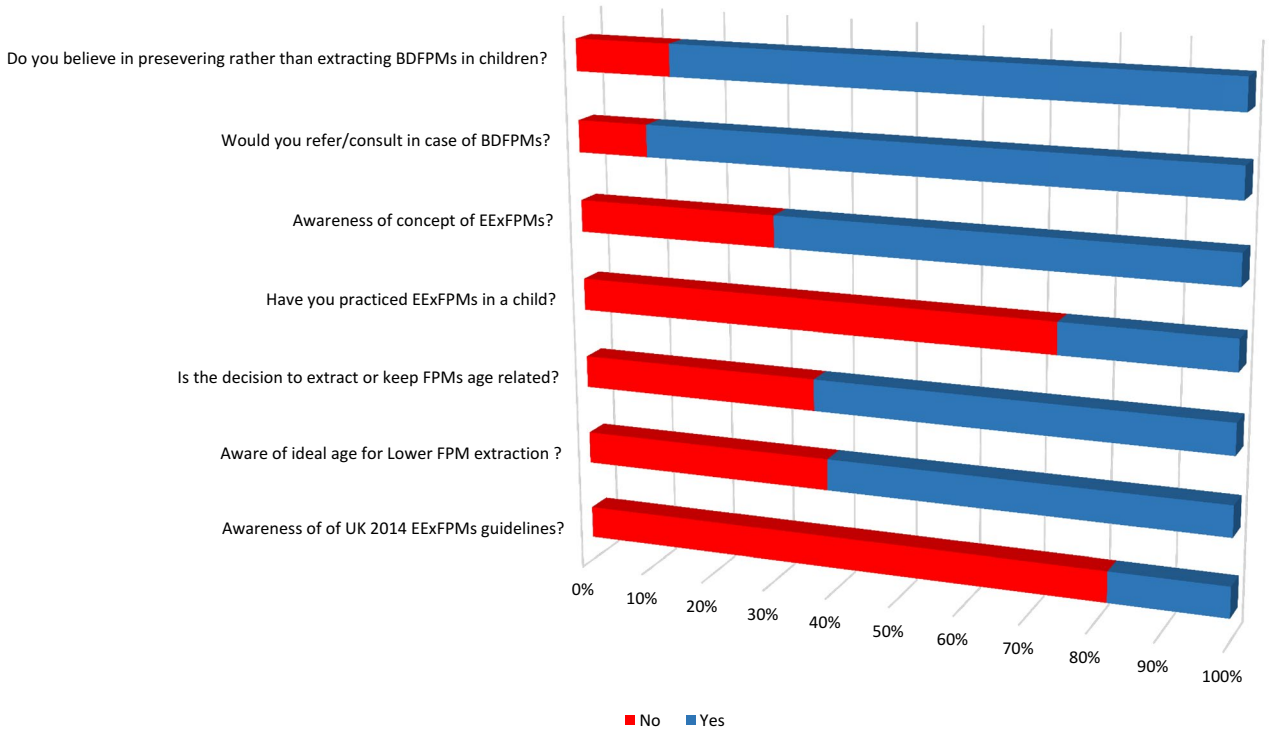

Fig. 2 The overall responses to questions related to BDFPM (Broken down first permanent molars) and EExFPMs (Enforced extraction of first permanent molars)

levels (general practitioners and specialists). Among which, 157 were GDPs, 23 were PDs and 19 were other dental specialties. The demographics are presented in Table 1.

Part one: questions related to BDFPMs management

The first question described a case of a scenario of 7-year-old child with BFDPMs and a class I occlusion (Fig. 1) and suggested management options were given (Q1—see Table 2). Overall, when assessing the responses as a whole, there was no agreement amongst those surveyed. The results were further analysed according to the variables specialty, education background (See breakdown in Table 2). There was a statistically significant difference in the management options of the above scenario according to specialty ($p = 0.021$). With PDs more likely to restore the BDFPMs with stainless steel crowns (SSCs), then consider extractions at a later date, compared to GDPs.

The second question asked participants if they believe in preserving BDFPMs as much as they can instead of extracting them in children (Q2—see Table 2). Overall, most of the participants (84.9%, $n = 169$) believed in preserving BDFPMs as much as they can. The third question asked about the importance of the child's age when dealing with BDFPMs (Q3—see Table 2). Overall, a majority (62.8%, $n = 125$) said that the age of the child does affect the decision whether to extract or keep the BDFPM. When the responses for Q2 and Q3 were cross tabulated against specialty, training background; no statistically significant differences were found.

The fourth question was related to the referral pattern in the given scenario (Q4—see Table 2). Overall, the majority (89.9%, $n = 177$) would consult or refer to a PD or orthodontist, while only 11% ($n = 22$) would self manage and treat without referral or consultation. When cross-tabulating the responses to the above question against training background and specialty there was a statistically significant difference ($p = 0.006$ and $p = 0.003$ respectively). Education/training background reveled a different referral pattern; 38.4% of Arab trained dentists would consult (discuss) the case with a PD specialist and treat themselves as a first choice, while half of western-trained dentists would consult an orthodontist first then treat, as opposed to Asian trained dentists whose first choice was to "I am confident enough to diagnose and treat the patient" (36.4%).

Table 1 Demographics of participants ($n = 199$)

Variables	*n* (%)
Gender	
F	123 (62)
M	76 (38)
Specialty	
General dental practitioner (GDP)	157 (78.9)
Paediatric dentist (PD)	23 (11.6)
Other specialities	19 (9.5)
Education place/qualification	
Arab countries	159 (80)
Asian countries	11 (5.5)
Western: (America + Europe)	29 (14.5)
Years in practice: Mean (SD)	11 (+4)
Age: Mean (SD	30.96 (± 7.736)

Part two: EExFPMs awareness responses

The fifth question asked "have you ever heard about the concept of EExFPMs?" (Q5—see Table 3). Overall, the majority responded affirmatively (68.9%, $n = 137$). When cross-tabulating the responses against specialty, education/training background, a statistically significant relationship was found ($p = 0.002$) with specialty only (see Table 3 for details). PDs were more aware of the concept. The *sixth question* "have you ever considered enforced extraction of (a) BDFPM(s) in children as a treatment option?" (Q6—see Table 3), the overall responses were split into "no" (51%, $n = 101$) and "yes" (49%, $n = 97$). When cross-tabulating these responses against specialty, training background, statistical significance was found with training background and specialty ($p = 0.001$ for both) (see Table 3 for details).

The seventh question "have you ever performed EExFPMs for BDFPMs in a child?" (Q7—see Table 3). A large majority had not practiced EExFPMs (74.2%, $n = 147$). When cross-tabulating the responses of the above question against training background and specialty, no statistical significant differences were found.

The eighth question asked, "Are you aware of the UK 2014 guidelines of the EExFPMs in children?" (Q8—see Table 3). A large majority (81.8%, $n = 163$) were not aware of such a guideline. When cross-tabulating the above responses against the specialty, education/training background, statistically significant relationship was found with specialty only ($p = 0.007$). PDs (43.5%, $n = 10$) were fully aware about these guidelines compared to GDPs (14.6%, $n = 23$) and other specialities (15.8%, $n = 3$).

The ninth question evaluated participants' knowledge regarding the ideal age to extract broken down lower FPMs in a child if needed (Q9—see Table 3). For this question, there was only one correct response out of four given answers, which was "8.5 to 10.5 years old". A majority of participants (61%, $n = 117$) answered this question correctly. When cross-tabulating the responses of the above question against specialty, training background, statistical significance was found with the training background only ($p = 0.001$). Western-trained dentists were significantly more aware of the ideal age for EExFPMs.

Table 2 A summary of the questions and responses of those surveyed about the preferred management of BDFPMs

Questions	Variables options	Specialty GDP *n* (%)	PD *n* (%)	Other *n* (%)	*p* value	Education background Arab *n* (%)	Western *n* (%)	Asia *n* (%)	*p* value
Q1: A fit and well 7-year-old boy visited your dental clinic with very sensitive teeth and the examination revealed lower FPMs to be severely hypo mineralized with post-eruption breakdown as well as a class I malocclusion. What would your first line of treatment be?	Do nothing	13 (8.3)	0 (0)	0 (0)	0.021*	12 (7.5)	0 (0)	0 (0)	0.22
	Build up the crowns with composite	34 (21.7)	2 (8.7)	7 (36.8)		32 (20.1)	4 (16.7)	4 (36.4)	
	Root canal treat the teeth and crown them	21 (13.4)	1 (4.3)	2 (10.5)		23 (14.5)	0 (0)	1 (9.1)	
	Place stainless steel crowns SSCs over these teeth and wait till the child gets older and extract these teeth	39 (24.8)	14 (60.9)	5 (26.3)		45 (28.3)	10 (41.7)	2 (18.2)	
	Place GIC temporary restorations only	50 (31.8)	6 (26.1)	5 (26.3)		47 (26.9)	10 (41.7)	4 (36.4)	
Q2: Do you believe in preserving the BDFPM as much as you can instead of extracting it in children?	No	20 (12.7)	7 (30.4)	3 (15.8)	0.086	22 (13.8)	7 (29.2)	0 (0)	0.052
	Yes	137 (87.3)	16 (69.6)	16 (84.2)		137 (86.2)	17 (70.8)	11 (100)	
Q3: Does the age of the child affect your decision regarding keeping the BDFPM tooth or extracting it?	No	61 (38.9)	5 (21.7)	8 (42.1)	0.255	60 (37.7)	5 (20.8)	8 (72.7)	0.13
	Yes	96 (61.1)	18 (78.3)	11 (57.9)		99 (62.3)	19 (79.2)	3 (27.3)	
Q4: If I have a case like above	I will refer the patient to paediatric dentist specialist for treatment	42 (26.8)	4 (17.4)	5 (25.6)	0.003*	40 (25.2)	6 (25)	3 (27.3)	0.006*
	I will consult with a paediatric specialist, but treat the patient	62 (39.5)	4 (17.4)	2 (10.5)		61 (38.4)	2 (8.3)	2 (18.2)	
	I will consult with an orthodontic specialist but treat the patient	42 (26.8)	9 (39.1)	7 (36.8)		44 (27.7)	12 (50)	2 (18.2)	
	I am confident enough to diagnose and treat this patient alone-no referral or consultation	11 (7.0)	6 (26.1)	5 (26.3)		14 (8.8)	4 (16.7)	4 (36.4)	

*Chi-square

Table 3 A summary of the questions and responses of those surveyed about enforced extractions of first permanent molars (EExFPMs)

Questions	Variables options	Specialty GDP *n* (%)	PD *n* (%)	Other *n* (%)	*p* value	Education background Arab *n* (%)	Western *n* (%)	Asia *n* (%)	*p* value
Q5. Have you ever heard about the concept of EExFPMs?	Yes, but I am not practicing it	51 (32.5)	5 (21.7)	6 (31.6)	0.002*	49 (30.8)	7 (29.2)	6 (54.5)	0.132
	Yes, I am familiar with and practicing it	26 (16.6)	11 (47.8)	1 (5.3)		29 (18.2)	7 (29.2)	0 (0)	
	Yes, but I do not agree with enforced extraction of any molar teeth	28 (17.8)	6 (26.1)	3 (15.8)		28 (17.6)	3 (12.5)	4 (36.4)	
	No, I have no idea about it	52 (33.1)	1 (4.3)	9 (47.4)		53 (33.3)	7 (29.2)	1 (9.1)	
Q6. Have you ever considered enforced extraction of (a) BDFPM(s) in children as a treatment option?	No, I should preserve the tooth/teeth as much as I can	91 (58.3)	4 (17.4)	6 (31.6)	0.001*	88 (55.7)	2 (8.3)	9 (81.8)	0.001*
	Yes, but first I should consult with orthodontics	65 (41.7)	19 (82.6)	13 (68.4)		70 (44.3)	22 (91.7)	2 (18.2)	
Q7. Have you ever performed any enforced extraction of BDFPMs for a child?	No	121 (77.1)	12 (54.5)	14 (73.7)	0.077	119 (75.3)	15 (62.5)	9 (81.8)	0.34
	Yes	36 (22.9)	10 (45.5)	5 (26.3)		39 (24.7)	9 (37.5)	2 (18.2)	
Q8. "The Enforced Extraction of First Permanent Molars In Children" guidelines (2014) in the UK	No, I am not aware of these guidelines	101 (64.3)	10 (43.5)	9 (47.4)	0.007*	65.4 (104)	9 (37.5)	5 (45.5)	0.09
	No, I know that dentists in the UK support and practice EExFPM but I never knew there were guidelines	33 (21.0)	3 (13.0)	7 (36.8)		30 (18.9)	8 (33.3)	3 (27.3)	
	Yes, I am fully aware of these guidelines	23 (14.6)	10 (43.5)	3 (15.85)		25 (15.7)	7 (29.2)	3 (27.3)	
Q9: What is the ideal timing for extraction of broken down lower FPMs if needed?	Correct answer: 8 ½–10 ½ years of age	91 (58)	20 (87)	10 (52.6)	0.099	95 (59.7)	19 (79.2)	3 (27.3)	0.001*

*Chi-square

Discussion

The compromised BDFMPs, due to dental caries and/or MIH (SDCEP 2018), and its management is a real problem faced by dentists dealing with children globally and in the UAE where caries (AlAyyan et al. 2017) and MIH (Hussain et al. 2018) are prevalent and where this study was conducted. However, there is no agreement in the dental profession regarding treatment of these teeth, as the treatment for the BDFPM due to caries or MIH is complicated and confusing (Chen and Leggit 2012; Taylor et al. 2019). This may be because of the lack of knowledge about different types of treatment approaches and the most appropriate one based on the age of the patient (El Meligy et al. 2016). Treatment options that are indexed for FPMs and BDFPMS include: no treatment, fissure sealants, permanent restorations, temporary restorations, SSCs, fixed permanent crowns with or without root canal treatment (Lygidakis et al. 2010; AAPD 2016) and also the EExFPMs (RCSEng 2014; SDCEP 2018). Our study showed that dentists in this region offered various treatment options for a given scenario involving the BDFPMs. This is in agreement with a recent study by UK dentists (Taylor et al. 2019).

Many advocate restoration of such teeth in the right circumstances (Randall 2002; Lygidakis et al. 2010; Dhareula et al. 2018), ideally by utilising SSCs as the restorative material of choice due to excellent longevity outcomes (Zagdwon et al. 2003; Kotsanos et al. 2005; Chen et al. 2013; Discepolo and Sultan 2017; Koleventi et al. 2018) or minimally invasive cast adhesive copings (Gaardmand et al. 2013). While others clearly advocate that FPM extraction can be followed by successful eruption of second permanent molar to provide the suitable replacement (SDCEP 2018; Saber et al. 2018). Ultimately, the third molar would erupt to complete the molar dentition and balance the occlusion (Cobourne et al. 2014). Therefore, it is important for practicing dental surgeons to access and use appropriate clinical guidelines that outline the extraction management of FPMs. The AAPD guidelines outlined many management options for young immature permanent teeth (including molars) such as apexogenesis and apexification (AAPD 2016). While on the opposite side, the RCSEng published its guidelines in 2009 and updated them in 2014 (RCSEng 2014); these guidelines, available online, raised the importance of EExFPMs. The latter concept is yet to be endorsed as a treatment modality by the AAPD. Many dentists in the UAE, a country of 200 nationalities, who deal with children come from various educational backgrounds and may be exposed to various schools of thoughts, but is thought that the AAPD guidelines are generally followed. This was reflected in our study, as many as 82% of those surveyed were not aware of the UK guidelines of EExFPMs.

In our study, there was no agreement amongst those surveyed about how to manage BDFPMs. This finding was similar to other studies such as Kopperud et al. (2016). A majority of the participants in our study (65%) recommended a more conservative treatment, such as temporary dressings, root canal treatments/crowns and composite built up. This conservative tendency may could be attributed to their educational background which encouraged the preservation of the BDFPMs (Al-Madi et al. 2018) and the reluctance of dentists to extract BDFPMs (Kopperud et al. 2016; Silva et al. 2016) and not their extraction and the availability of the relevant AAPD guidelines online (AAPD 2019). Although as was expected, more than 60% of PDs who participated in our study would preserve the BDFPMs by placing SSCs in a 7-year-old, to decide later to extract or not when the child reaches the ideal age. In contrast, in the Silva et al. study (2016), 100% of the participants opted for restorative options. SSCs were the treatment option for majority of dental professionals (63.6%) in this study in cases of moderate to severe young BDFPMs due to MIH, which more than those in a Norwegian study (Kopperud et al. 2016) and a Saudi Arabian study (Silva et al. 2016), however, EExFPMs was not considered as an option in the latter studies. This restorative drive was further confirmed in our study as 85% believed in the principle in preserving BDFPMs rather than extracting them.

When a dental referral is made, recognizing one's own boundaries and competencies is a moral and professional responsibility and the referral must be made in the patients' best interests (Madi et al. 2018; General Dental Council 2013). Furthermore, a multidisciplinary cooperation with orthodontics is often required, particularly for BDFPMS -where orthodontic consequences in particular- need to be considered (Williams and Gowans 2003). In addition, the EExFPMs guidelines clearly urge dentists, if in doubt, to seek an orthodontic opinion (RCSEng 2014). Our study reassuringly showed that the majority of the participants (89%) would involve other specialties by consulting them or referring their patient to them in the case of BDFPMs. This being said, there was lack of agreement to whom a referral or consultation would be. This is in agreement with the findings of similar studies (Taylor et al. 2019).

Our study assessed the "ideal time" to extract a BDFPM. If a lower BDFPM is to be extracted, the ideal time for its loss is with the commencement of calcification of the bifurcation of the second permanent molars (Battagel 1985), which usually occurs at a chronological age of 8–10 years (Thunold 1970; Cobourne et al. 2014). This should facilitate mesial movement of the second permanent molar into the FPM area when a good contact will be established with the second premolar (Gill et al. 2001; Teo et al. 2013, 2016). Earlier extraction before the age of 8 years might result in distal drifting and rotation of the unerupted second premolar,

especially in the spaced dentition, or when there has been early loss of the second primary molar. Conversely, late extraction (which is during or after the eruption of the second permanent molars) will result in an unsatisfactory space closure (Saber et al. 2018; Cobourne et al. 2014). Despite the majority of dentists in our study being pro conservation of the BDFPMs, a majority of the participants (63%) were aware that ideal timing for extracting FPMs was age related and indeed 61% of the sample where aware of the correct timing of 8 ½–10 ½ year of age. In our study, it was clear that Western-trained dentists were more aware of the latter compared to the other groups. Our interpretation for this is that the concept of losing FPMs early is taught in the undergraduate and postgraduate dental curriculum of many Western countries (Travess et al. 2004; McDonald et al. 2011; SDCEP 2018; Welbury et al. 2018). On the contrary, Albadri et al. (2007) found that primary care dentists (mainly GDPs) did not have enough knowledge of optimum time to extract FPMs in children. Additionally, it important not to forget that the knowledge of the timing of extraction FPM remained elusive to 37% of participants in our study. This may be explained by the fact that amongst dentists, extraction of premolars (at a later age) and not FPMs remain the most popular choice for orthodontic purposes (Travess et al. 2004; Dardengo et al. 2016). Many may feel that extracting molar teeth for orthodontic purposes ruins a patient's profile and compromises their facial aesthetics (Williams et al. 2004). This also may explain why many of our participants did not think that extraction of BDFPMs were age related nor did they know the ideal extraction time of BDFPMs.

In the present study, 69% of participants claimed they were "aware" of enforced extraction principle option but surprisingly only 26% claimed they had practiced it, suggesting a gap between knowledge and practice. As we expected, and significantly so, 96% of PDs were familiar with the EExFPMs but only 48% had practiced it, which was much higher than the remaining groups, again this highlights a gap between knowledge and practice. This finding similar to a UK study (Taylor et al. 2019) where PDs was higher than GDPs, with the latter favouring restorations rather than extractions. Interestingly, it is important to recall that, in the BDFPMs scenario case in our study, 60.9% of PDs (more than any other group) would consider SSCs then EExFPMs in the "ideal time". This was more than that reported in the UK study highlighted above which was 32.4% (Taylor et al. 2019).

While many investigated the deficiency knowledge of dentists regarding the management of BDFPMs (Kopperud et al. 2016; Albadri et al. 2007; El Meligy et al. 2016), to our knowledge, there were no available studies regarding the dentists' knowledge about the concept of EExFPMs. Despite extraction of BDFPMs being carried out routinely in some parts of the world (Albadri et al. 2007) these extractions were often done incorrectly and outside the optimum time, indicating possible lack of awareness of the EExFPMs. In addition, GDPs appeared to attempted to restore these teeth when extraction would have been more appropriate (El Meligy et al. 2016; Taylor et al. 2019). The former study reported that there was little known regarding the way dentists were adopting treatment decisions developed for management of BDFPMs and that most of the respondents recommended a more conservative treatment such as a protective liner and indirect pulp capping, for BDFPMs for 6 to 9 year-old patients rather than enforced extraction. In this study, the guidelines published by the AAPD were recommended to help dentists make appropriate decision for the management of BDFPMs in children. However, Taylor et al. (2019) clearly showed a divide between what GDPs and PDs think when faced with a BDFPM, but alluded to the UK guidelines as a reference. Our study is one of a few studies that had investigated the knowledge and experience of EExFPMs among GDPS and PDs in the UAE. Interestingly, in our study a large proportion dentists claimed awareness of the concept of EExFPMs but actually disagreed with it, preferring to maintain the FPMs. This was in agreement with the conservative approach of reported in other studies (El Meligy et al. 2016; Kopperud et al. 2016) and strengthens the overall perception of the majority in our study population prefer to maintain BDFPMs rather than remove them. This is despite the fact that, many current restorative techniques may fail to help the child patient to conserve the BDFPM (SDCEP 2018). For example, in Australia, more than 50% of children over the age of 11 years have had some caries experience in this tooth and many have amalgam and composite restorations (Ong and Bleakley 2009). Such restorations generally have a limited life and may need to be replaced within 5–10 years because of the possibility of secondary caries (Elsheikh and Ali 2015). The second cavity preparation will need to be larger than the first due to the necessity to remove more carious structure, and this undoubtedly weakens the remaining tooth substance and thus threatens the life of the molar's pulp entering the tooth into "the restorative cycle" (Henry 2014). Therefore, it would be expected in many cases that the FPM would require extraction (RCSEng 2014; Elsheikh and Ali 2015). In our study, the majority of participants (85%) believed in preserving rather than extracting the BDFPM, and when asked separately, only 49% had "considered" EExFPMs. The latter differed according to specialty and background training: It was statistically noticeable that (91.7%) Western-trained dentists and 82.9% of PDs of the sample group considered EExFPMs after orthodontic consultation more than the other groups. GDPs, in considering EExFPMs were more in favor of preserving the BDFPMs (a majority

of 58.3%), falling in line with consensus to maintain these teeth. Moreover, consideration of EExFPMs is one thing, and the practice of EExFPMs is another. This study went further in probing this aspect and asked the participants if they had actually practiced EExFPMs of BDFPMs, the majority (74%) clearly said no, confirming the conservative approach of the majority of those surveyed. Another explanatory factor to consider may be the local culture and acceptability of the parents, as many dentists may not want to extract because parents may not be happy with this treatment option. In line with our study, in the study by El Meligy et al. (2016), a majority of the respondents recommended a more conservative treatment such as a protective liner, and indirect pulp capping, for BDFPMs for 6 to 9 years old patients than enforced extraction.

Despite the EExFPMs guideline being widely available, our study showed that only 18% of responders were fully aware and familiar with this guideline, indicating a very low knowledge level across all groups. Although PDs showed better overall awareness, a majority (56.5%) of them were not aware of this guideline, while on the other hand 85.3% of GDPs and 84.2% of other specialists never heard of such guideline. When we compared this result to the actual awareness of the concept of EExFPM discussed above, we noted the findings followed a similar pattern, with PDs showing more awareness of the concept of EExFPMs than GDPs and other specialties. Given the fact that these guidelines were only issued in the past 10 years, the year of graduation of those surveyed might have affected their knowledge. In addition, it is stipulated that many undergraduate schools in the Arab world (where most of our participants trained) did not include these guidelines in their undergraduate curricula. Additionally, the lack of dentists' awareness of guidelines is not new. It had previously been reported that evidence based dentistry and guidelines are not concepts that every dentist is familiar with (Iqbal and Glenny 2002), and access to such information is not methodically disseminated. However, even in ideal situations, it had been reported that guidelines improved dentists' knowledge but not their clinical decision-making skills (Bonnetti 2006; Afrashtehfar and Assery 2017; Bhayat et al. 2013).

El Meligy et al. in their study in 2016, found out that the respondents' recommendations were slightly inconsistent in clinical scenario survey. Surprisingly, their possible explanation was the lack of conclusive treatment guidelines in the literature regarding BDFPMs. We noted in our study a slight contrast and inconsistency regarding practice and knowledge. As the majority of participants were aware of the ideal age for extraction of FPMs, but had never practiced the procedure of EExFPMs, despite saying that they were aware of the concept of EExFPMs yet being actually unaware of 2014 UK guidelines.

Conclusion

In the UAE dentist sample surveyed, there was a preference for preserving the BDFPMs rather than extracting them in children, despite knowing when the ideal time for extraction was. Training background and specialty were influencing factors. There was a lack of awareness of the actual UK 2014 EExFPMs guidelines. This highlights the need to disseminate best practice guidelines regularly as part of continuous professional development.

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Compliance with ethical standards

Conflict of interest The authors have no conflicts of interest to declare.

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