

# ORIGINAL ARTICLE

# Referral Patterns of Pediatric Oral Surgery Cases: A Pilot Survey of United Arab Emirate Dentists

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# Abstract

**Objective:** To assess the referral patterns of General Dental Practitioners (GDPs) and Pediatric Dentists (PDs) when faced with a range of Pediatric-Oral Surgery (POS) cases. Material and Methods: Eighty-two dentists treating children [51.2% GDPs (n=42) and 48.8% PDs (n=40)] were shown clinical photographs or radiographs of twelve common POS cases. Opinions on whether to "manage it yourself", "refer to a/another pediatric dentist", "refer to an oral surgeon (OS)", "refer to a multidisciplinary clinic (MDC)", or "do nothing" were sought. Statistical analysis was carried out using SPSS software with Chi-square test (p≤0.05). Results: Both GDPs and PDs reported significantly higher referrals to OS of: 1) lower lip mucoceles (50%, 52.5% respectively), 2) exposure of impacted maxillary canine (64%, 51.3%) and 3) dento-alveolar trauma cases (73.8%, 65%). A majority of GDPs and PDs reported self-managing of: 1) removal of multiple deciduous carious teeth (81%, 97.5%), 2) odontogenic infections with facial swelling (57.1%, 92.5%), 3) removal of ankylosed submerged primary molars (66.7%, 95%) and 4) dental trauma (71.4%, 100%). PDs reported self-managing primary herpetic gingivostomatitis (PHGS, 95%) compared to 45.2% of GDPs. GDP referral of PHGS to the PDs was 42.9%. There were no significant differences between both groups regarding removal of a mesiodens, release of a tongue-tie, a labial frenectomy, or a lip laceration, but the majority would refer to oral surgeons in these cases. Conclusion: Whilst United Arab Emirates dentists sampled referred some pediatric-oral surgery cases to oral surgeons, general dental practitioners were reluctant to refer pediatric-oral surgery cases to pediatric dentists, preferring to self-manage them.

Keywords: Pediatric Dentistry; Surgery, Oral; Referral and Consultation.



# Introduction

Dentists have skills and competence to manage a variety of cases within dentistry that may vary from one to another [1]. According to the General Dental Council in the United Kingdom (UK), dentists may carry out a multitude of dental procedures [2], as long as they are suitably trained and indemnified, which is similar to the scope of practice of most dentists around the world. Child dental patients may present with a variety of pediatric-oral surgery (POS) [3] problems that can be challenging to general dental practitioners (GDPs) or pediatric dentists (PDs) needing oral surgery (OS) input.

There are established policies governing referral guidelines in many aspects of dentistry [4-6], facilitating the decision making process when a referral is being considered. However, there are no specific general POS referral guidelines, although some local guidelines may exist [7,8], related to the referral pathway for the POS interface; i.e. to whom a GDP or a PD should refer when faced with a particular POS clinical problem, and what criteria should be followed.

Taking the UK as an example [1], the core clinical competencies of an oral surgeon, have been precisely outlined [9] however, the specialist training curriculum for pediatric dentists is not as clear [10]. The latter covers specific aspects of oral pathology, oral medicine, management of impacted supernumerary teeth, management of elements of maxillofacial, soft tissue and dentoalveolar surgery, to which a minimum level of skills is required [10]. The guidelines, although not specific, encourage pediatric dentists to liaise with or refer to other specialties when appropriate.

In the United Arab Emirates (UAE), there are no similar national specialist training curricula or guidelines for dentists who deal with POS cases. The aim of this study was to explore this un-researched aspect of dentistry. We therefore, sought to survey opinions of UAE dentists dealing with children, about to whom they would refer, if faced with such cases.

# Material and Methods

# Study Design and Sampling

A cross-sectional convenience sample, of dentists treating children, was used in this study. Due to the absence of a central dentist registry in the UAE, we sought participants at two major pediatric dentistry conferences held in the UAE. Given the nature of the conferences, it was expected that delegates routinely managed children as part of their clinical duties. Inclusion criteria were; fully qualified dentists who were practicing in the UAE. Exclusion criteria were: anyone attending one of the conferences and who was one of the following; undergraduate dental student, hygienist, technician or therapist.

# Data Collection

An interview-based anonymized questionnaire was conducted. The questionnaire was divided into two sections comprising a series of questions pertaining socio-demographics (gender, qualifications, years of experience, specialty) followed by a set of questions assessing the management of common POS cases.



These POS cases were selected after a standard setting exercise was conducted after consulting two oral surgeons, two pediatric dentists and two general dental practitioners. As a result, the top 10 commonly selected POS cases were chosen and were a mix between cases lying within, on the borderline or outside the competency of a GDP, hence potentially requiring referral. Ten clinical photographs/radiographs of different common soft and hard tissue POS cases (Figure 1 and Table 1) were presented to the participants and were asked about their opinions on how to manage or refer each POS case displayed. We added two cases that were not true POS cases (i.e., would not normally require the intervention of an oral surgeon) to test the validity of the questionnaire and to act as control cases (making the total 12 cases).

The clinical photos/radiographs were obtained from our own pool of patients (except one for which permission to was obtained). Consent to use these non- identifying photos had been obtained from the parents/carers previously. For clarity and validity of the survey, a pilot survey was conducted on 10 randomly selected dentists in MBRU. Their responses were not included in the final results.

The 12 cases (10 POS cases + two control cases) were hypothesized to be in children deemed to be cooperative, thus excluding behavior difficulties as a confounding factor. The cases selected were (Figure 1 [a to 1] and Table 1): a) A lower lip mucocele; b) A tongue-tie; c) Extraction of multiple carious deciduous teeth; d) An exposure or removal of an impacted maxillary canine; e) A labial frenectomy; f) An odontogenic infection with facial swelling; g) Primary herpetic gingivostomatitis (PHGS-control case); h) A removal of ankylosed submerged primary molar; i) Simple dental trauma (control case); j) Dento-alveolar trauma; k) Suturing of a lip laceration and l) Removal of an unerupted/impacted mesiodens.

The possible referral options were (Table 1): 1) self-manage/do it yourself; 2) refer to an oral surgeon/oral surgery (OS); 3) refer to a/another pediatric dentist (PD); 4) refer to multidisciplinary clinic (MDC) or 5) do nothing (no referral, no treatment). Two control referral options were included here: "to do nothing" and asking a pediatric dentist to "refer to another pediatric dentist".

Surveyed Groups	Pediatric-Oral Surgery Cases (POS)	<b>Referral Options</b>
General Dental Practitioners (GDPs)	(a) Lower lip mucocele	(1) Self-manage
Specialists in Pediatric Dentistry (PDs)	(b) Tongue-tie	(2) Refer to an oral surgeon $(OS)$
	(c) Extraction of multiple carious deciduous	(3) Refer to a/another pediatric
	teeth	dentist (PD)
	(d) Exposure of impacted maxillary canine	(4) Refer to a multidisciplinary
		(T) D
	(e) Labial Frenectomy	(5) Do nothing
	(f) Odontogenic infection with swelling	
	(g) Primary herpetic gingivo-stomatitis	
	(h) Ankylosed submerged primary molar	
	(i) Dental trauma	
	(j) Dento-alveolar trauma	
	(k) Lip laceration	
	(l) Unerupted mesiodens	

Table 1. Surveyed groups, Pediatric-Oral Surgery (POS) cases and referral options.



a) A Lower Lip Mucocele



b) A Tongue-tie



c) Extraction of Multiple Carious Deciduous Teeth



d) An Exposure or Removal of an **Impacted Maxillary Canin** 

g) Primary Herpetic Gingivo-

Stomatitis





h) A Removal of Ankylosed Submerged Primary 1st Molar





i) Simple Dental Trauma



Unerupted/Impacted Mesiodens

\*with permission of Prof. Richard Welbury.

j) Dento-Alveolar Trauma\*

Figure 1. Pediatric-Oral Surgery cases (POS).

k) Suturing of a Lip Laceration

Data Analysis

The data was collected and entered in to a Microsoft Excel® spreadsheet (Microsoft Corporation, Redmond, Washington, USA) then tabulated and analyzed using SPSS® (IBM, Armonk, New York, USA). Pearson's Chi-square test was used to test the association between variables such as specialty, and the management or the referral pattern of different POS cases. P value  $\leq 0.05$  was set as the level of significance for all the tests.



# Ethical Aspects

The study was approved by the ethics and research committee at the Hamdan Bin Mohammed College of Dental Medicine (HBMCDM), Mohammed Bin Rashid University of Medicine and Health Sciences (MBRU).

# Results

Out of 120 dental professionals attending the conferences that we approached and agreed to take part in the interview, 38 participants were later excluded (although their data were captured but not analyzed) as they declared that they did not currently treat children due to the nature of their specialty (restorative, endodontic, prosthodontic dentists) hence the exclusion. The remaining 82 dentists surveyed were GDPs or PDs. These two groups were roughly equal in size [51.2% GDPs (n=42) and 48.8% PDs (n=40)] from different international backgrounds working in the UAE. The study population demographics were 57 (61.3%) females and 36 (38.7%) males, the median years of experience of participants was nine years (ranging from 5 to 40 years).

We looked at the difference between GDPs and PDs as the main variable by assessing the chosen option for managing the specific POS cases displayed. The following were the results for each case (Table 2, Figures 2 and 3). In the following section, when the results were statistically significant between both GDP and PD groups, detailed results were reported. When no significant difference was found between the two groups, an overall trend of referral was reported.

# Lower Lip Mucocele Case

When faced with a mucocele affecting the lower labial mucosa, the results comparing referral patterns of GDPs to PDs showed differences that were statistically significant (p=0.05). Overall, a majority of the dentists interviewed would refer the mucocele case to an oral surgeon (OS) (51.2%, n=42) regardless of whether they were a GDP or PD, followed by self-management (30.5%). In the GDP group, a large proportion of GDPs (50%, n=21) would refer such a case to OS, followed by either self-management or referral to PDs equally (23.8%, n=10 for each referral option). Only one GDP (2.4%) would choose to do nothing. No referrals were made by GDPs to a MDC. In the PD group, a majority also (52.5%, n=21) would refer such a case to OS. However, compared to GDPs, a larger proportion of PDs (37.5%, n=15) would treat the mucocele themselves. Four PDs (10%) would opt to do nothing. No referrals were made to a MDC. PDs would not refer to other PDs.

# Tongue-tie Case

When faced with a child who has a tongue-tie, both GDPs and PDs were similar in their referral patterns (no statistically significant difference between the two groups). The majority of the overall referrals were to OS (54.9%, n=45) while around 40% of GDPs and PDs would treat the case themselves. No dentist chose to "do nothing" or "refer to MDC" with this case. GDPs would rarely refer such a case to a PD, and PDs would never refer this case to another PD.

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Table 2. The	e POS ref	erral opti	ons of GI	DPs and H	DS.											
		0v	erall (N=8	(2)			G	DPs (N=49	()			Р	Ds (N=40)			
POS Case	Self-	Ref to	Refer to	Refer to	$\mathrm{Do}$	Self-	Refer to	Refer to	Refer to	$\mathrm{Do}$	Self-	Refer to	Refer to	Refer to	$\mathrm{Do}$	
	Manage	OS	PD	MDC	Nothing	Manage	OS	PD	MDC	Nothing	Manage	os	PD	MDC	Nothing	p-value
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	
Labial	25(30.5)	42 (51.2)	10(12.2)	0 (0.0)	5(6.1)	10(23.8)	21 (50)	10(23.8)	0 (0.0)	1(2.4)	15(37.5)	21 (52.5)	0 (0.0)	0 (0.0)	4(10.0)	0.05*
Mucocele																
Tongue-tie	33 (40.2)	45 (54.9)	4(4.9)	0 (0.0)	0 (0.0)	17 (40.5)	21(50)	4(9.5)	0 (0.0)	0(0.0)	16(40)	24(60.0)	0 (0.0)	0 (0.0)	0 (0.0)	0.123
Ex Carious 1º	73(89)	0 (0.0)	8(9.8)	1(1.2)	0 (0.0)	34(81)	0 (0.0)	8(19)	0(0.0)	0(0.0)	39 (97.5)	0(0.0)	0 (0.0)	1(2.5)	0 (0.0)	0.01*
Teeth																
Impacted Maxillary	10(12.3)	47(58)	2(2.5)	22 (27.2)	0 (0.0)	5(11.9)	27 (64.3)	2(4.8)	8 (19)	0 (0.0)	5(12.8)	20(51.3)	0 (0.0)	14 (35.9)	0 (0.0)	0.05*
Canine																
Labial	32(41)	35 (44.9)	2(2.6)	9(11.5)	0 (0.0)	16 (38.1)	19 (45.2)	2(4.8)	5(11.9)	0 (0.0)	16(44.4)	16(44.4)	0 (0.0)	4(11.1)	0 (0.0)	0.590
ę																
Odontogenic Infection with	61(74.4)	12(14.6)	6(7.3)	3 (3.7)	0 (0.0)	24(57.1)	9(21.4)	6(14.3)	3(7.1)	0 (0.0)	37 (92.5)	3(7.5)	0(0.0)	0(0.0)	0(0.0)	0.002*
Swelling																
PHGS	<mark>57 (69.5</mark> )	2(2.4)	18(22.0)	4(4.9)	1(1.2)	19(45.2)	1(2.4)	18(42.9)	4(9.5)	0 (0.0)	38 (95.0)	1(2.5)	0 (0.0)	0 (0.0)	1(2.5)	0.000*
Ankylosed 1º Molar	66 (80.5)	7(8.5)	6 (7.3)	3 (3.7)	0 (0.0)	28 (66.7)	6(14.3)	6(14.3)	2(4.8)	0 (0.0)	38 (95.0)	1(2.5)	0 (0.0)	1(2.5)	0 (0.0)	0.01*
Dental	70 (85.3)	0 (0.0)	11(13.6)	1(1.1)	0 (0.0)	30 (71.4)	0 (0.0)	11(26.2)	1(2.4)	0 (0.0)	40(100)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0.001*
Trauma																
Dento-alveolar Ridge Trauma	15(18.3)	57 (69.5)	7 (8.5)	3 (3.7)	0 (0.0)	3(7.1)	31 (73.8)	7 (16.7)	1(2.4)	0 (0.0)	12 (30)	26 (65.0)	0 (0.0)	2(5.0)	0 (0.0)	0.004*
Lip Laceration	40(48.8)	31(37.8)	4(4.9)	7(8.5)	0 (0.0)	19 (45.2)	14 (33.3)	4(9.5)	5(11.9)	0 (0.0)	21(52.5)	17 (42.5)	0(0.0)	2(5.0)	0 (0.0)	0.131
Unerupted	63(76.8)	13(15.9)	3 (3.7)	3 (3.7)	0 (0.0)	29 (69.0)	9(21.4)	3 (7.1)	1(2.4)	0 (0.0)	34 (85)	4(10.0)	0 (0.0)	2(5.0)	0 (0.0)	0.132
Mesiodens																
Yellow shaded a Gingivostomatit	ıreas represe is.	nt the first o	choices for n	nanagement	of POS case	s; Green sha	ded areas rep	present the t	wo control r	eferral optio	ns of the PO	S cases; *Sta	itistically sig	;nificant; PH	GS=Primary	<sup>,</sup> Herpetic

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Figure 2. GDP and PD referral patterns of POS cases (Cases a to f).



Figure 3. GDP and PD referral pattern of POS cases (Cases g to l).

Multiple Carious Deciduous Teeth Extractions

When faced with a child requiring multiple extractions of primary teeth, the referral pattern differed between GDPs and PDs and this was statistically significant (p=0.01). Seventy-three dentists (89%) of those asked would carry out multiple extractions of carious primary molars

themselves with no referrals to OS at all. In the GDP group 81% (n= 34) would manage the case by themselves. No referrals were made to OS or MDC at all, although some GDPs (19%, n=8) referred such a case to PDs (p=0.01). In the PD group, an outright majority (97.5%; n=39), managed such cases by themselves. No referrals were made to OS at all. Only one PD referred the case to a MDC (2.5%). No PDs referred the case to other PDs. No dentist in any of the above groups chose to do nothing.

#### Exposure or Removal of Impacted Maxillary Canine Case

With a child requiring the surgical exposure of an impacted maxillary canine, the referral patterns between GDPs and PDs were statistically significantly different (p=0.05). Overall, the majority of cases (58%; n=47) would be referred to OS, followed by a MDC (27.2%; n=22) and self-management (12.3%; n=10). In the breakdown of the results, a larger proportion of GDPs would refer to OS compared to PDs (64.3% and 51.3% respectively), while more PDs would refer such a case to the MDC compared to GDPs (35.9% compared to 19%). GDPs would rarely refer such a case to PDs (4.8%; n=2) and PDs would never refer it to another PD. A similar proportion of both GDPs and PDs would self-manage such cases (11.9% and 12.8%). No dentist in any of the above groups chose to do nothing as an option.

#### Labial Frenectomy Case

When faced with a child requiring a labial frenectomy, there was no significant difference between GDPs' or PDs' referral patterns. It seemed that both GDPs and PDs would equally refer to OS (overall 44.9%; n=35) or perform the procedure (41%; n=32) themselves. Although not statistically significant, there was a tendency for GDPs to be reluctant to refer a frenectomy to PDs, and PDs would never refer such case to another PD. A small proportion (11.5%; n=9) out of the total of both groups would refer to a MDC. No dentist in any of the groups chose to do nothing.

#### Odontogenic Infection with Facial Swelling Case

In the common occurrence of a child presenting with a facial swelling of odontogenic origin, the pattern of referrals between GDPs and PDs were significantly statistically different (p=0.002). In the GDP group, more than half of GDPs (57.1%; n=24) would manage the case on their own, followed by 21.4% referring to an OS (n=9) and 14.3% would refer to a PD (n=6). In the PD group, most of PDs would manage such cases themselves (92.5%; n=37), while 7.5% of them (n=3) would refer to OS. PDs would never refer such a case to another PD and both groups would never refer to a MDC. Overall, 74.4% (n=61) of all those interviewed would treat the case themselves, and only 14.6% (n=12) would refer to OS. No dentist in any of the above groups chose to do nothing.

#### Primary Herpetic Gingivostomatitis Case

As mentioned above, this clinical case was used as a control case. The patterns of referral differed between GDPs and PDs and was very significant statistically (p=0.000). In the GDP group,

45.2% of GDPs would manage this case by themselves (n=19) or refer to PDs (42.9%; n=18), followed by referral to a MDC (9.5%; n=4) and finally to OS (2.4%; n=1). In the PD group, an outright majority of PDs (95%; n=38) would manage such cases themselves, followed by referral to OS or do nothing equally (2.5%; n=1 both referral options). PDs would not refer such patients to a MDC or another PD. Overall 69.5% (n=57) of all those asked would manage such a case themselves rather than referring to OS.

#### Removal of Ankylosed Submerged Primary Molar Case

In the case of an ankylosed submerged primary molar, there were significant differences between GDPs' and PDs' referral patterns (p=0.01). In the GDP group, a majority of them (66.7%) would manage this case themselves (n=28) followed by equal referrals to OS and PD (14.3%; n=6 for both). 4.8% (n=2) would refer to MDC.

In the PD group, an outright majority of PDs (95%; n=38) would manage this case themselves, with a small proportion referring to OS or MDC (2.5%; n=1 both referral options). No PDs would refer such a case to another PD. Overall, 80.5% of those who were questioned (n=66) would treat such cases themselves with only 8.5% (n=7) referring to OS. No dentist in any of the above groups chose to do nothing.

# Simple Dental Trauma Case

This was the second control case. When faced with a simple dental trauma case, the referral patterns between GDPs and PDs differed significantly (p=0.01). In the GDP group, a large proportion of GDPs (71.4%; n=30), would manage such a case themselves, with only 26.2% of GDPs (n=11) referring to a PD and 2.4% (n=1) referring to a MDC. None of the GDPs would refer to OS. In contrast, in the PD group, all of the PDs surveyed (100%, n=40) would manage such a case by themselves. No PDs would refer such cases to any other source. Overall, 85.2% (n=69) of those interviewed would carry out treatment of dental trauma themselves. No referrals were made to OS and no dentist in any of the groups chose to do nothing.

## Dento-Alveolar Trauma Case

When faced with an alveolar ridge trauma, the referral patterns between GDPs and PDs differed significantly (p=0.004). In the GDP group, the majority of GDPs (73.8%; n=31) would refer such cases to OS, followed by referral to PD (16.7%; n=7), then manage themselves (7.1%, n=3) and finally refer to a MDC (2.4%; n=1). In the PD group, 65% of PDs (n=26) would refer such a case to an OS, while 30% (n=12) would manage it themselves, followed by a referral to a MDC clinic (5%, n=2). PDs would not refer such cases to other PDs. Overall, 69.5% of all those interviewed (n=57) would refer such a case to OS. No dentist in any of the above groups chose to do nothing.

#### Lip Laceration Case

There was no significant difference in the referral patterns of GDPs and PDs when it came to the case of a lower lip laceration in a child. Overall, 48.8% (n=40) would prefer to manage such cases themselves, followed by a referral to OS (37.8%; n= 31). Whilst GDPs (9.4%; n=4) would rarely refer such a case to PDs, PDs would never refer such a case to another PD and 8.5% (n=7) would refer to MDC. No dentist in any of the groups chose to do nothing.

## Unerupted Mesiodens Case

There was no significant difference in the referral patterns of GDPs and PDs when it came to the case of removal of an unerupted mesiodens in a child. GDPs and PDs (76.8%; n=63) would mainly manage such case by themselves followed by referral to OS (15.9%; n=13) and referral to MDC (3.7%; n=3). Three GDPs (7.1%) would refer such a case to a PD but none of the PDs would refer to another PD. No dentist in any of the two groups chose to do nothing as an option.

#### Discussion

Our pilot study of a sample of UAE dentists showed that the management of POS cases and referral pattern were not well defined and uniform. As the UAE has no central registry of dentists available, we sought the opinion of dentists attending two pediatric dentistry conferences, and this could be considered a limitation of this study.

Generally when a 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. A referring dentist has a duty of care to refer a patient to the specialty best suited to treat the case if the case falls outside the boundaries of their competency [2], it has been reported that most GDPs refer complex oral surgical cases to OS in adults, but the referral pattern is not known in relation to children [11].

The dentist, to whom a referral is being made, must be trained, competent and indemnified before carrying out such treatment and they believe that the suggested treatment is appropriate for the patient [11]. In addition, financial interests or gains for such a professional must not interfere with treatment choices. Although appearing to differ between healthcare systems [12], this aspect was not assessed in our study. In many cases, such as POS, clinical management varies from dentist to dentist and from country to country [13]. Our study had shown that management of POS cases varied also between specialties (in this case between GDPs and PDs).

Whether to self-manage or refer represents on many occasions a clinical dilemma. The oral surgery and pediatric dentistry services in the UK for example, usually receive many referrals concerning children with many ending up undergoing treatment under sedation or general anesthesia [14-16], as such services are not available in the GDP environment. The oral surgery service in England in 2015 received over a year period, the highest proportion of GDPs referrals (37.7% of a total of 80,000 referrals) while 14% of the referrals were made to pediatric dentistry and 25.2% of the referrals were made to orthodontics (many of them children) [4] and many GDP

referrals made were reported to be inappropriate [17]. Despite a thorough search, we could not find similar UAE figures, as there are no clear pathways of referral to oral surgery or pediatric dentistry available to scrutinize. Thus, it would be expected that GDPs/PDs would refer appropriate cases based on their own initiative, to either oral surgery or pediatric dentistry specialists or multidisciplinary clinics if such cases fall outside their levels of competency. The UAE has a similar scope of practice guidelines to UK [18]. For example, Dubai Health Authority's scope of practice guidelines demonstrate that GDPs are allowed to perform procedures on the orofacial complex, teeth, and the hard and soft tissues surrounding or supporting the teeth, while OSs are allowed to perform a procedure on tissues of the oral-facial complex below the surface of a mucous membrane or in or below the surfaces of the teeth. PDs are allowed to diagnose certain pathologies related to pediatric dentistry, oral pathology, and perform oral surgical procedures applicable to the child dental patient as well as diagnosing and managing traumatized and affected primary and permanent teeth but the referral pathways were not made clear [18,19].

In our study, we included internal control scenarios and referral options to test the validity of the questionnaire. Two cases out of the 12 cases used were control cases (that we would expect the participants to negate the need for an OS input) and were included in the questionnaire in order to internally verify the validity of the POS cases. The first control case was a simple dental trauma case (fractured tooth). It was selected by the authors as a hard tissue control case that could be easily managed by the dentist without the need for OS input; this was because it was not a true POS case. Due to the presence of clear and available guidelines provided by the International Association of Dental Traumatology (IADT) that outlined and facilitated such treatment [20], GDPs or PDs could follow and apply without OS input. The second control case was PHGS that was selected as a soft tissue control question. This also did not present a true POS case requiring surgical intervention, but rather an oral medicine case that should be easily managed by the dentist through palliative treatment and observation only [3] In our study, whilst 80 out of 82 (97.6%) dentists did not refer the PGHS case to OS, no one referred the dental trauma (tooth fracture) to OS at all (100%), giving the cases chosen in the questionnaire internal validity.

We also included two control referral options, to help internally assess the validity of the referral options in the questionnaire. The first one was the option to "do nothing" (no treatment and no referral); because of the POS cases used, the action to "do nothing" (no treatment and no referral) was considered not to be an acceptable response. Therefore, it was expected that no one would choose this option. This was indeed the case as only 6 participants out of the 82 chose to "do nothing" (7.3%) meaning that 92.7% took affirmative action. The second control referral option was asking PDs to refer to another PD. It was expected that no PD would refer any of the POS cases outlined to another PD (in the same specialty status). Our study showed this was the case as none of the PDs (0.0%), referred any of the cases to other PDs.

When giving referral options, we included five options (self-manage, refer to OS, refer to a/another pediatric dentist, refer to a MDC and do nothing). It appeared that those surveyed were

confident in their oral surgical skills in managing the proposed POS cases in the first instant. Our results show that the overall first referral choice of the dentists surveyed in this UAE study would be to self-manage the majority of the POS cases presented to them. This is because in seven out of the 12 cases (removal of multiple deciduous carious teeth, odontogenic infection with facial swelling, primary herpetic gingivo-stomatitis, extraction of ankylosed of primary molar, dental trauma, lip laceration and unerupted mesiodens) the majority of dentists primarily preferred to treat such cases themselves. The remainder of the 12 cases (five cases; lower lip mucocele, tongue-tie, exposure of maxillary canine, labial frenectomy and dento-alveolar trauma) would be primarily referred by the surveyed dentists to OS. Interestingly, none of the cases would be primarily referred to a/another PD by those surveyed. This may be explained that some PDs would feel competent to manage such cases themselves rather than refer to another PD. However, this study also highlighted that the GDPs were reluctant to refer POS cases to PDs, placing PDs further down the referral pathway list. What was also evident was that despite some of these cases requiring multidisciplinary management (like the case of the impacted maxillary canine, and impacted mesiodens) the majority of those participants did not consider MDC referral as a first choice at all, which was surprising considering that multidisciplinary management would lead to an optimal outcome [21,22].

When we looked at the detailed referral pattern of the GDP component in this study, and compared it to the PD component, we found that it followed the overall referral pattern. The GDPs were confident enough in their own abilities to manage seven out of 12 cases (multiple extractions of carious primary teeth, odontogenic infection with facial swelling, primary herpetic gingiva-stomatitis, ankylosed submerged primary molars, dental trauma, lip lacerations and unerupted mesiodens), while opting to refer the remaining 5 cases to OS. It was surprising to note that the majority of GDPs did not refer to PDs as their first choice in any of the 12 POS cases. It may be conjectured that GDPs assumed they were competent enough to do the cases themselves. However, GDPs would choose to refer to PDs as a second choice for the management of dental trauma, dento-alveolar trauma, removal of carious primary teeth, management of primary herpetic gingivo-stomatitis and extraction of ankylosed submerged primary molars.

In the case of the exposure of impacted maxillary canine case; a panoramic radiograph of a deeply impacted canine was shown to participants. It was an interesting observation that the majority of both GDPs and PDs would refer this case to OS rather without having a multidisciplinary approach involving an orthodontist. According to the American Academy of Pediatric Dentistry (AAPD) [3] consultation between the practitioner and an orthodontist is useful in the final treatment decision and an orthodontist should be involved in such case. It was also noticed that GDPs would rarely refer such a case to PDs; this is a different referral pattern compared to UK where the majority of GDPs would refer an impacted canine case to a pediatric dentist or a MDC [22].

In the case of an ankylosed submerged primary molar; although it was assumed that the participants would refer the case to OS, as the case might become complicated and the operator should have adequate surgical skills to complete the case, the majority of both GDPs and PDs preferred to do it themselves. It was reasonable that the majority of GDPs and PDs would refer an alveolar ridge trauma case to OS, but GDPs were keen to refer to OS than PD while PDs had a tendency to treat the case themselves compared to GDPs. In the case of extraction of impacted mesiodens, both GDPs and PDs would mainly manage such case by themselves followed by referral to OS. That was surprising as the case might have required raising a surgical flap and subsequent suturing. However, when faced with a lower labial mucocele or a tongue-tie, labial frenectomy; a large majority of participants would refer such a case to OS regardless of whether they were a GDP or PD.

In the case of an odontogenic infection with facial swelling, the clinical picture shown to the participant was an orofacial swelling case, which was drained and treated under general anesthesia. Interestingly, the results of the survey showed that the majority of GDPs would manage the case on their own, followed by referring to OS and PD. The assumed explanation of the GDP choices in this case would be that it could be treated by prescribing oral antibiotics. Despite the fact that this case may be a life threatening condition that requires inpatient admission and hospitalization with intravenous antibiotics according to the AAPD guidelines [3]. It was sensible that PDs would manage an outright majority of such cases themselves as they have the training and access to a hospital environment.

PHGS is an oral medicine case rather than POS case and was included in the survey as a control question as mentioned above in order to validate the questionnaire. It is worth mentioning that oral medicine clinics are not readily available in the UAE, and our study showed that the majority of both GDPs and PDs would manage this simple oral medicine case by themselves.

With regards to the lip laceration case, the results of the survey were extremely surprising as the majority would manage the case by themselves followed by a referral to OS. The lip laceration involving the vermilion border has a major aesthetic component and requires special training including maxillofacial, dermatological, plastic surgery. There is a big concern that the GDP/PDs would have the adequate training and competence to correctly realign the vermillion border and successfully achieve the cosmetic component of the procedure.

Financial incentive may be a huge factor on the referral patterns in UAE, as dental treatment is mostly provided in private practice with insurance coverage. This reduces the referrals as GDPs would try to carry any treatment so they can charge the patient either directly or through health insurance. In comparison, it is actually the opposite in the UK as the National Health Service (NHS) funding will cover the cost of any case referred to OS or admitted under GA in a hospital setting. Availability of services has an effect on the referral patterns and can heavily influence what the referrer would do. In the UK, oral surgery service is well-established and readily available services in all areas. On the other hand, pediatric dentistry service is only available in major cities and it is less accessible compared to oral surgery. There is no difference of the availability of oral surgery and pediatric dental service in the UAE; however, most patients seek GDPs for all type of dental treatments.

POS cases require special attention that may need the involvement of other specialties. While all OSs and some PDs are trained to treat such cases, PDs and GDPs should consider referring such patients to OS or MDC when appropriate. The authors strongly recommend specifying clearer referral guidelines and clearer interactive pathways between GDPs and specialists for these specific cases.

#### Conclusion

Whilst the United Arab Emirates dentists sampled referred some pediatric-oral surgery cases to oral surgeons, general dental practitioners were reluctant to refer pediatric-oral surgery cases to pediatric dentists, preferring to self-manage them.

#### **Authors' Contributions**

This paper follows the FLAE sequence (First-Last-Author-Emphasis). The author's contributions were as follows. HAM: Main author of paper, conducted the surveys. SD: Designed and conducted of surveys with contribution to paper proof reading. AHK: Statistical analysis. MK: Proof reading. IH: Overall supervisor of project, graphs and table designs, main author of paper and corresponding author.

# **Declaration of Interests**

The authors have no financial or other interests to declare. This project was presented as a poster and abstract at the National Conference of the British Society of Paediatric Dentistry, Leeds, UK in 2016 [24]

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