JOURNAL OF INTERNATIONAL CRISIS AND RISK COMMUNICATION RESEARCH
ISSN: 2576-0017
2024, VOL 7, NO S9

Assess Knowledge of early Orthodontic Problems among Pediatric Dentists

Sarah Abdullah Alshahri[1], Zahra Abdulkhalek Alhammadi[2], Maytham Hassan Alallasi[3], Saeed Ali Aldera[4], Ahmed Dakhel Alanazi[5], Hassan Hosni Halawani[6], Ahmed Ali Saeed Al Dera[7], Hanan Omar Basamair[8], Ibrahim Awad Ahmad Shabel[9]

[1]Pediatric Dentist, Ministry of Health (Riyadh Specialized Dental Center) RSDC
[2]Ministry of Health (Eastern Health Cluster, Dammam Medical Complex) Dentist
[3]Dentist MOH, Health cluster of Madinah Albadrani Health Center
[4]Dentist, Ministry Of Health PHCC
[5]Family dentist, MOH (First cluster of Riyadh), Prince Salman bin Mohammed Hospital in (Delam)
[6]Ministry of Health (Albadrani Primary Health Care Center) Madina, Dentist
[7]Ministry of Health, Primary Health Care Center Dentist
[8]Dental Assistant, Dental Clinic Complex in South Riyadh
[9]Dentist, Al hlami PHCC

ABSTRACT

Background: Early orthodontic treatment, or interceptive treatment, is aimed at halting or redirecting the development of malocclusions in pediatric patients. Early intervention can enhance aesthetics, improve function, and reduce the complexity of future malocclusion treatments. General dental practitioners (GDPs) and pediatric dentists (PDs) play a key role in the early identification and management of these issues, but research on their knowledge and practices regarding early orthodontic problems is limited. This study investigates the knowledge, practice, and challenges faced by GDPs, PDs, and postgraduate pediatric dentistry students (PGPDSs) in diagnosing and managing early orthodontic problems.

Methods: A cross-sectional study was conducted with 182 participants, including 133 GDPs, 23 PDs, and 26 PGPDSs, selected from public healthcare facilities and academic institutions. A self-administered, anonymous questionnaire was used to assess participants' knowledge of early orthodontic issues and practices in treatment and referral. The questionnaire also included case studies for evaluating participants' ability to identify and manage early orthodontic problems. Knowledge and practices were categorized into good, average, or poor based on predefined scores.

Results: The response rate was 87.4%, with 159 completed questionnaires. Knowledge of early orthodontic issues was moderate, with GDPs scoring the lowest in identifying and timing treatment. Although most participants demonstrated good practices in immediate treatment and referrals, all groups showed poor performance in selecting appropriate orthodontic appliances. GDPs had the lowest scores for appliance selection. Challenges identified included a lack of clinical experience and insufficient knowledge for treating certain cases, particularly in GDPs.

Conclusion: Knowledge of early orthodontic issues was moderate across all groups, with GDPs exhibiting the lowest levels. While the practice of immediate treatment and referrals was generally good, the selection of appropriate appliances was poorly performed. The lack of confidence, particularly due to limited clinical experience, was the primary barrier to providing early orthodontic care. There was no significant correlation between knowledge and practice. Addressing these gaps through further education and clinical experience may improve the management of early orthodontic problems.

Introduction

Early orthodontic treatment, also known as interceptive treatment, seeks to halt, redirect, or interrupt the development of a malocclusion (Joondeph, 1993). While the choice between early and late orthodontic treatment remains debated, research suggests that early intervention can enhance aesthetics, improve function, and contribute to better occlusal stability (Al Nimri and Richardson, 2000; King and Brudvik, 2010; Nagn and Fields, 1995; Rinchuse, 2002). Early treatment can also reduce the severity and complexity of malocclusion (Nagn and Fields, 1995). Studies have demonstrated improvements in malocclusion and a decrease in the need for further treatment through interceptive strategies, highlighting their effectiveness (Al Nimri and Richardson, 2000). While interceptive treatment may not always yield finished results of the highest quality, it has proven effective in improving malocclusion (King and Brudvik, 2010). In certain cases, early intervention can shorten treatment duration and reduce costs (Karaiskos et al., 2005; Nagn and Fields, 1995).

General dental practitioners (GDPs) and pediatric dentists (PDs) are typically the first to evaluate pediatric patients. Therefore, early identification of malocclusions that could affect the normal growth and development of the child's teeth should be a priority in primary dental care (DiBiase, 2002; Nagn and Fields, 1995). However, due to limited research on the knowledge and practices related to early orthodontic issues, many regions do not include orthodontic care as part of public healthcare services, and such treatments are often not covered by insurance (DiBiase, 2002; Hsieh et al., 2005; Kerosuo et al., 2012; Keski-Nisula et al., 2008; Nagn and Fields, 1995; Shalish et al., 2012). In areas with limited orthodontic resources and services, early detection of orthodontic problems by GDPs and PDs can significantly aid in addressing these issues. Therefore, understanding the knowledge, perceptions, and challenges related to diagnosing and managing early orthodontic problems among professionals who treat pediatric patients is crucial. This information can play a pivotal role in the success of orthodontic treatments and in reducing the complexity of malocclusion cases (Aldrees et al., 2015; Berk et al., 2014).

The objective of this study was to explore the gaps in knowledge and practice, as well as the challenges faced by GDPs, PDs, and postgraduate pediatric dentistry students in diagnosing and managing early orthodontic problems.

Materials and Methods

This study conducted at several public healthcare facilities, including hospitals and a university clinic. The study involved 133 randomly selected general dental practitioners (GDPs).

Once potential participants were identified, they were approached at their workplaces, where the study's purpose was explained. Upon agreeing to participate, they were given a self-administered, anonymous questionnaire. The first page of the questionnaire included an informed consent form outlining the study's objectives and procedures. To ensure privacy and confidentiality, participants' completion of the questionnaire was considered as implied consent. Ethical approval was granted by the university's Medical Campus Research Ethical Committee.

The questionnaire was written in English and designed by combining questions from two previously validated and reliable surveys (Aldrees et al., 2015; Mathisen and Eriksen, 2011). The newly developed questionnaire was further validated by two consultant orthodontists and a consultant in dental public health. Its reliability was tested on 12 subjects. It was estimated that participants would require 20 to 30 minutes to complete the questionnaire. The survey had two sections: the first section included questions about the participants' knowledge and the orthodontic procedures they typically perform, including the orthodontic issues they address and the appliances they use; the second section featured six questions related to twelve orthodontic cases illustrated as photos (P1 to P12) that required early recognition and intervention. The cases covered were: anterior dental crossbite, anterior skeletal crossbite, severe crowding, transient crowding, anterior open bite, thumb sucking, increased overjet, physiological diastema, delayed eruption of incisor, unilateral posterior crossbite, early loss of space, and impacted canines. For each case, assessment questions were designed to evaluate participants' knowledge on identifying early orthodontic problems and optimal treatment timing, their practices regarding immediate treatment, and their referral practices along with the selection of appropriate orthodontic appliances.

Knowledge and practice were categorized as good, average, or poor based on predefined scores, which were calculated by the percentage of correct responses out of the total questions. Scores were categorized as good (75%–100%), average (50%–75%), and poor (<50%).

Results

Out of the 182 participants, 159 completed the questionnaire, representing a response rate of 87.4%. This included 121 general dental practitioners (GDPs) (76.1%), 21 pediatric dentists (PDs) (13.2%), and 17 postgraduate pediatric dentistry students (PGPDSs) (10.7%). The response rates were 91% for GDPs, 91.3% for PDs, and 65.4% for PGPDSs. Of the participants, 82.4% were females (131 participants), and 17.6% were males (28 participants), with an average age of 28.14 ± 5.16 years.

Regarding employment, 52% of GDPs worked in the government sector, while 47% of PDs and 52% of PGPDSs were employed in academic institutions. Additionally, 27% of PDs and 37% of PGPDSs worked part-time in private clinics. Most participants reported acquiring their orthodontic knowledge during their undergraduate education.

Knowledge was assessed by evaluating the participants' ability to identify early orthodontic issues and choose the appropriate treatment timing. Nearly half of the GDPs, PDs, and PGPDSs had average scores for identifying early orthodontic problems. Over 80% of participants could identify single tooth crossbite, anterior open bite, thumb sucking, increased overjet, delayed eruption of the incisor, and impacted canines.

When evaluating knowledge of optimal treatment timing, 62% of PDs and 65% of PGPDSs had average knowledge scores, while 66% of GDPs had poor knowledge scores.

Practice was evaluated based on the participants' ability to administer immediate treatment, refer patients to an orthodontist, and choose the correct orthodontic appliance when needed. Most participants (95% of GDPs, 85.7% of PDs, and 88.24% of PGPDSs) demonstrated good practice scores in terms of immediate treatment and referral patterns combined. GDPs tended to refer most of their orthodontic cases, except for thumb-sucking cases.

However, when asked about selecting the appropriate orthodontic appliance, 94% of GDPs, 66.7% of PDs, and 82% of PGPDSs scored poorly. Yet, 47% of GDPs, 90.5% of PDs, and 100% of PGPDSs were able to select the right appliance for a single anterior tooth in crossbite.

As for the challenges faced, GDPs primarily cited a lack of practice as the main reason for not providing treatment for the listed cases. Over half (54.6%) of GDPs also reported that a lack of knowledge was why they did not treat anterior open bite cases. PDs and PGPDSs indicated that they provided immediate treatment for specific cases such as anterior single tooth crossbite (76.2% of PDs and 82.4% of PGPDSs), thumb sucking (66.7% of PDs and 70.6% of PGPDSs), and delayed eruption of incisors (38.1% of PDs and 47.1% of PGPDSs). Additionally, 47% of PGPDSs reported being able to treat cases with multiple teeth in anterior crossbite and severe crowding.

There was no correlation found between knowledge and practice among the three groups of participants ($P > 0.05$).

Table 1. Appropriate selection of orthodontic appliance needed for treatment of the provided 12 cases among a sample of GDPs (n=121), PDs (n=21) and PGPDSs (n=17).

	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12
GDPs (%)	47	21.49	5.8	33.9	22.3	38.0	24.8	0	9.1	16.5	15.7	30.6
PDs (%)	90	47.6	4.8	61.9	33.3	47.6	19	4.8	38.1	28.6	23.3	38.1
PGPDSs (%)	100	29.4	5.9	76.5	29.4	52.9	29.4	0	17.6	0	29.4	47.1

* P1, anterior dental crossbite; P2, anterior skeletal crossbite; P3, severe crowding; P4, transient crowding; P5, anterior open bite; P6, thumb sucking; P7, increased

overjet; P8, physiological diastema; P9, delayed eruption of incisor; P10, unilateral posterior crossbite; P11, early loss of space; and P12, impacted canines.

GDP, general dental practitioners; PD, paediatric dentists; PGPDS, postgraduate paediatric dentistry students.

Discussion

This research is the first to examine the knowledge and practices of general dental practitioners (GDPs), pediatric dentists (PDs), and post-graduate pediatric dental specialists (PGPDSs) in relation to early orthodontic issues. The significance of this study lies in the fact that these three categories of dental professionals are typically the initial healthcare providers for pediatric patients and are often the first to identify orthodontic problems at an early stage. Early intervention in orthodontics plays a crucial role in improving dental aesthetics, function, and occlusal stability (Al Nimri and Richardson, 2000; King and Brudvik, 2010; Nagn and Fields, 1995; Rinchuse, 2002). Consequently, evaluating these practitioners' knowledge and practices concerning early orthodontic problems is vital for understanding their perceptions and the challenges they face in offering timely preventive and interceptive treatments.

A validated self-administered questionnaire was employed in this study, achieving a high response rate, surpassing that reported in earlier research (Aldrees et al., 2015; Berk et al., 2014; Borrie et al., 2014; Borrie and Felicity, 2013; Mandall et al., 2005). The high response rate was likely due to the distribution and collection of questionnaires directly at the participants' workplaces. The findings indicated that knowledge of early orthodontic problems was moderate across all three groups, with PDs and PGPDSs demonstrating average knowledge about the optimal timing of treatment, whereas GDPs had notably poorer knowledge in this area.

In many low- and middle-income countries (LMICs), such as Sudan, GDPs working in public hospitals are often the first to identify orthodontic issues in children. Their ability to detect and manage early orthodontic problems can significantly reduce the complexity of cases and, in some situations, negate the need for more extensive treatments (Nagn and Fields, 1995). Additionally, understanding the optimal treatment timing is crucial for ensuring timely referrals to orthodontists, reducing waitlists (Aldrees et al., 2015; Berk et al., 2014), and providing caregivers with the confidence to advocate for early intervention. The study found significant differences in knowledge scores, with GDPs having the lowest scores compared to PDs and PGPDSs, which could be attributed to the insufficient integration of interceptive orthodontics in the dental curriculum and limited postgraduate training in this field.

A study of undergraduate students in the USA found that they lacked the skills necessary to identify early malocclusion (Brightman et al., 1999), a finding consistent with the present study where GDPs scored lower than PDs and PGPDSs. The higher scores among PGPDSs in identifying early orthodontic issues and selecting the right treatment timing could be due to their access to a more immersive learning environment and direct consultations with orthodontists as part of their training.

The assessment of practice showed that the majority of participants had good practices in terms of immediate treatment and referral to orthodontists. However, there was a notable deficiency in selecting the appropriate orthodontic appliances, with GDPs scoring the lowest. Although GDPs performed less well than PDs and PGPDSs in immediate treatment and referrals, the differences were not statistically significant. Most GDPs preferred referring orthodontic cases to specialists rather than treating them, except in cases of thumb-sucking. The lack of confidence in handling immediate orthodontic treatments, particularly due to insufficient skills, was cited as the main reason for referrals. Previous studies (Sutton et al., 2005; Mathisen and Eriksen, 2011) have also highlighted a similar trend among GDPs, where a lack of clinical and postgraduate experience, combined with insufficient interest and job satisfaction, leads to underperformance in orthodontic treatments.

Both PDs and PGPDSs reported providing early treatment for cases like anterior single tooth crossbite, thumb-sucking, and delayed eruption of incisors. In addition, PGPDSs treated more complex cases, such as multiple teeth in anterior crossbite and severe crowding. These findings align with previous research (Hilgers et al., 2003). However, PDs and PGPDSs cited a lack of confidence, mainly due to limited practical experience, as the reason they were hesitant to provide early orthodontic treatments.

In terms of appliance selection, all three groups performed poorly, with GDPs showing the weakest results. Despite this, PDs and PGPDSs showed better proficiency in selecting the appropriate appliance for treating an anterior single tooth in crossbite. A notable discrepancy was observed in the ability of PGPDSs to perform immediate treatment for multiple teeth in crossbite, though few could correctly select the appliance. The lack of confidence among PGPDSs in selecting the correct appliance was identified as a key reason for referring such cases to orthodontists. These findings are inconsistent with previous studies from Saudi Arabia, Australia, and the USA (Aldrees et al., 2015; Galbreath et al., 2006; Sivaneswaran and Darendeliler, 2001), where PDs were found to be more confident in choosing orthodontic appliances. This discrepancy could be due to differences in clinical training across institutions.

This study found no correlation between knowledge and practice, suggesting that participants' confidence was a major factor affecting their ability to apply their knowledge in clinical practice.

The results emphasize the need to improve both knowledge and practical skills in interceptive orthodontics through curricular revisions at both undergraduate and postgraduate levels. In LMICs such as Sudan, where orthodontic services are predominantly private and often self-funded, empowering GDPs to confidently

recognize and treat early orthodontic issues would enhance public healthcare services and increase the utilization of orthodontic care among the general population. Research suggests that involving GDPs in orthodontic treatment improves their self-efficacy and the quality of orthodontic care provided (Borrie et al., 2014; Mathisen and Eriksen, 2011). Therefore, encouraging GDPs and PDs to engage in early orthodontic interventions can reduce treatment complexity, duration, and costs, especially in regions where orthodontic care is limited in public primary health facilities.

Conclusions

The knowledge of early orthodontic issues was moderate across all three groups, with GDPs having the lowest scores. Knowledge regarding the optimal timing for treatment was better among PDs and PGPDSs, with GDPs scoring poorly. In terms of practice, the performance of immediate orthodontic treatments and referrals was generally good across all groups, though GDPs had the lowest scores. The selection of appropriate orthodontic appliances was poorly performed by all three groups, with GDPs scoring the lowest ($P = 0.000$). Lack of confidence, largely due to limited clinical experience, was the primary reason for not providing early treatment. There was no significant correlation between knowledge and practice in addressing early orthodontic problems.

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