RESEARCH NOTE

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Parents' awareness towards preventive and interceptive orthodontic treatment



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Abstract

Objectives This study aims to assess the awareness and acceptance of preventive and interceptive orthodontic treatment among Saudi perents.

Methods The study used a 29-question questionnaire, covering parents' demographic data, parents' awareness of malocclusion and habits, and parents' acceptance of treatment. It included visuals of different malocclusions, normal occlusion, and specific habits.

Results Parents mostly recognized single anterior tooth crossbite (95.78%) as a problem that need early intervention, followed by skeletal Class II (94.16%) and severe lower incisor crowding (93.51%). Regarding oral habits, parents were most aware of thumb sucking (91.03%), followed by tongue thrusting (84.22%). Ninety seven percent of participating parents expressed high acceptance of early orthodontic intervention, mostly to avoid more complicated treatment or surgery. However, a few parents refused early treatment, mainly because they preferred to wait until the eruption of all permanent teeth.

Conclusions The majority of parents demonstrated a high level of awareness and willingness to pursue early treatment.

Keywords Awareness, Early diagnosis, Interceptive orthodontics, Orthodontics, Parents, Preventive orthodontics

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Introduction

Malocclusion is a developmental condition where there is a deviation from the normal alignment within or between the arches in any plane [1]. It is a multifactorial condition with many etiological factors such as genetics, trauma, habits, and other factors [2]. To date, many causes of malocclusion are still not clearly understood and has been classified differently by many authors [1].

The effort to address malocclusion problems earlier through preventive or interceptive orthodontics has led to many advantages. Early treatment during the growth and development stage aims to reduce or remove the imbalances between the skeleton and alveolar bone that impede normal occlusion, function, esthetics, and psychological wellbeing [3]. The major goal of this kind of intervention is to produce an environment that supports normal occlusal development. Preventive orthodontic



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treatment such as maintaining the space or changing a habit can stop the development of a malocclusion before it occurs. Whereas interceptive orthodontic treatment is the treatment that can be used during the early stages of malocclusion to guide the occurring abnormality to normalize or prevent further damage to the dentition. These methods include but are not limited to the correction of skeletal discrepancies in all three planes of space, restoration of lost space, maintenance of leeway space, and management of severe arch size and tooth size discrepancies. The main advantages of interceptive orthodontic treatment are improving the self-esteem and the aesthetic of the patients, controlling oral habits, and enhancing dentoalveolar, skeletal and muscular development before the complete eruption of permanent dentition [3]. In addition, early management has the benefit of reducing the malocclusion difficulty, shortening the comprehensive phase treatment time and reducing the cost [3].

Due to the importance of early orthodontic management of the developing craniofacial skeleton and occlusion, several studies have been conducted to investigate the parents' awareness and knowledge regarding their children's needs. Most of them agreed on the lack of awareness among the parents [4, 5]. As for the few research that was conducted in Saudi Arabia, the majority agrees with the low level of knowledge and moderate level of awareness when it comes to interceptive orthodontic treatment, to the contrary to one of the studies conducted in 2021 where they resulted with high levels of knowledge and awareness [4, 6, 7].

Literature indicates that dental problems have received the least attention, and primary teeth are even more neglected. Additionally, a child's oral health is mainly affected by the awareness, understanding, and way of thinking of parents [8-10]. Parents play an important role in their child's growth and development as they are the primary decision makers regarding their child's health. Therefore, awareness of dental health is important so that they can be guided and directed to prevent various oral problems from developing [11]. Seeking a preventive and interceptive orthodontic treatment is largely dependent on the parents' acceptance. The level of the parents' acceptance is directly affected by adequate knowledge and awareness about the malocclusion. For many parents the decision to seek orthodontic treatment for their child is multifactorial and it is related to social, cultural, and psychological factors [12].

There is a lack of studies evaluating Saudi parents' awareness regarding the mixed dentition malocclusion traits and habits using a comprehensive range of malocclusion that needs early intervention. This study aims to assess the awareness and acceptance of Saudi parents regarding preventive and interceptive orthodontic treatment for children in the Kingdom of Saudi Arabia and possible related factors.

Material and methods

The ethical approval for conducting the study was obtained from the Institutional Review Board at the King Abdullah International Medical Research Center-KAIMRC (SP21R/399/08). The parents' awareness of malocclusion and acceptance of early treatment were evaluated using an electronic self-administered, closeended questionnaire developed for the purpose of this study. The questionnaire was prepared in English and then translated to the local language using bilingual experts review. A set of 32 questions was prepared and shared with 10 experts in the field (board certified orthodontists). The content was validated using Lawshe's method and the content validity ratio (CVR) was measured for every question. The questions with CVR score of 0.62 or higher were maintained and the questions with CVR score of less than 0.62 were excluded [13]. The guestionnaire was adjusted accordingly to contain 29 questions. The inclusion criteria are Saudi parents who are 20 years and above with children younger than 12 years of age. Non-Saudi parents, parents with special needs children, and incomplete questionnaires were excluded from the study to minimize the introduction of confounding variables. Non- Saudi parents may have different cultural and educational background, which could influence their responses and introduce variablility unrelated to the study's main focuse. Similarly, parents with special needs children often have a greater access to the healthcare system, potentially leading to a higher level of knowledge about children malocclusion. The study procedure was explained to the parents, written consent was acquired, and participants were given the choice of not participating with no legal consequences. The questionnaire consists of three main sections, parents' demographic data, parents' awareness of malocclusion and habits, and parents' acceptance of treatment. Demographic data includes general information such as gender, age, educational level, working status, socio-economic status, number of children, and previous history of dentist and orthodontist visits. As for the malocclusion and habits awareness evaluation, a set of facial and dental graphics about different types of malocclusions that may benefit from early intervention was used as recommended by the American Association of Orthodontics [14–19]. These include single tooth anterior crossbite, posterior crossbite, anterior open bite, deep impinging overbite, severe

Malocclusion **Single Tooth Anterior Crossbite** Mild Crowding Class II Normal Spacing Sever Crowding Anterior Open Bite Normal Alignment **Posterior Crossbite** Class III (Anterior View) **Normal Occlusion** Class III (Lateral View) **Deep Bite Oral Habits** Thumb Sucking After Age Pacifier Sucking After Age **Mouth Breathing Tongue Thrusting** of 6

Fig. 1 Types of malocclusion and oral habits used to measure parents' awareness

crowding, class II and class III grower, these visual pictures were mixed with graphics of normal occlusion to differentiate between normal and abnormal occlusion. Moreover, habits of thumb and pacifier sucking, mouth breathing and tongue thrusting were included (Fig. 1). Questions regarding parents' acceptance of early orthodontic treatment and contributing factors were included. Data were analyzed using the statistical program SAS software version 9.4 (SAS Institute Inc., Cary, North Carolina, USA). Descriptive analysis to describe the findings regarding the demographic data, parents' awareness, and parents' acceptance. The Chi-Square test and Fisher's Exact Test were used to determine the correlation between categorical variables. Also, the Wilcoxon two-sample test was used to determine the association

between continuous variables and two-level categorical variables. And finally, the Kruskal–Wallis test was used to compare the distributions of a continuous variable across more than two independent groups. All statistical tests were considered significant at $p \le 0.05$.

Results

Demographic data

The data was collected using the Google Forms platform starting from September 2021 until September 2022. A total of 994 parents participated in the questionnaire; of them, 925 were Saudis. There was a higher participation from mothers (72%) compared to fathers (28%). Most of the parents were above 40 years of age, highly educated and working. For the socio-economic status, most of the participants have a monthly family income of more than 10,000 S.R., with relatively fewer participants (11.89%) reporting a low monthly income. The number of children of the participating parents was determined, and most of the participants were found to have more than four children, followed by three to four then one to two children (Table 1). Furthermore, the history of dental visits and their frequency per year was determined. More than 85% of the parents reported that their children had previously visited the dentist, with most of them (43.76%) having more than two visits/ year. The most common age of the child's first dental visit was six years old and below. Similarly, the history of previous orthodontist visits or treatment was assessed, and it was found that more than half of the parents reported a previous visit to an orthodontist for their children and only 41.84% of them received an orthodontic treatment (Table 1).

Parents' awareness

Parents' awareness was measured through a series of photographs representing different types of malocclusion and habits in mixed dentition. A total of eight types of malocclusions were assessed. Single anterior tooth crossbite was mostly recognized by parents as an orthodontic problem needing early intervention (95.78%), followed by skeletal Class II (94.16%), severe lower incisors crowding (93.51%), anterior openbite (92%), skeletal Class III viewed frontally (86.05%), posterior crossbite (85.62%), deep overbite (85.19%) and skeletal Class III viewed laterally (80.54%) respectively (Fig. 2, Table 2). Parents' awareness of oral habits that can cause orthodontic problems was the highest in thumb sucking habit (91.03%), followed by tongue thrusting (84.22%), pacifier sucking (75.57%), and mouth breathing (40.32%) respectively (Fig. 2, Table 2).

Table 1 Demographic data

	Ν	%
Gender		
Male	259	28.00
Female	666	72.00
Age		
30 or below	174	18.81
31–40	348	37.62
Above 40	403	43.57
Educational level		
High school or less	193	20.86
Bachelor degree/diploma	601	64.97
Master/doctorate degree	131	14.16
Working Status		
Working	484	52.32
Not- working	441	47.68
Monthly family income		
Less than 5000 SR	110	11.89
5001-10,000 SR	292	31.57
10,001–20,000 SR	298	32.22
More than 20,000 SR	225	24.32
Number of children		
1–2	237	25.62
3–4	323	34.92
More than 4	365	39.46
History of dentist visits		
Yes	793	85.73
No	132	14.27
Number of dentist visits/year		
Once	209	26.36
Twice	237	29.89
More than twice	347	43.76
Age of the child on the first dental visit		
6 years and below	427	53.85
7–9 years	189	23.83
10–12 years	81	10.21
13 years and above	96	12.11
History of orthodontist visits		
Yes	469	50.70
No	456	49.30
History of previous orthodontic treatment		
Yes	387	41.84
No	538	58.16

Overall, mothers were more aware than fathers about the malocclusion (p=0.0012). A positive correlation was found between an increase in parents' age (p=0.04), higher income (p=0.008), history of orthodontist visit



Fig. 2 Parents' awareness of malocclusion and oral habits

(p=0.006), previous history of orthodontic treatment (p=0.013) and parents' awareness. However, no correlation was found between parent's awareness and their educational level, working status, number of children, history of dentist visits, number of dentist visits/year, and age of the child at the first dental visit.

Regarding parents' awareness of oral habits, some similar finding was observed. Mothers were more aware than the fathers (p=0.04), higher awareness among older (p=0.0019) and higher income parents (p=0.05). In addition, an increased number of children (p=0.0103), an increased number of dentist visits/ year (p=0.019), a history of orthodontist visits (p=0.006) and previous history of orthodontic treatment (p=0.0002) has a positive relation with awareness level. No correlation was found between awareness and parents' educational level, working status, history of dentist visits and age of the child at first dental visit (Table 2).

Parents' acceptance

As parents play a major role in seeking treatment for their children, early intervention acceptance was evaluated and found to be very high, higher than 97% among participating parents. The most commonly reported reason was to avoid the need for more complicated treatment or surgery (74%), to improve esthetics and confidence of the child (68%), to improve the function (56%), psycho-social reasons (45%), dentist recommendation (32%), and their desire to protect their children from the same problems they had (29%), respectively. Few parents (25 out of 925) choose not to seek early intervention, as they prefer to wait for all permanent teeth to erupt and then start the orthodontic treatment (72%), which was the main reason for refusing interceptive orthodontic treatment, followed by high treatment cost (48%), long duration of treatment (24%), and lastly, their believe that orthodontic treatment is not important or necessary (16%).

It was found that mothers were more inclined than fathers to accept interceptive treatments (p=0.0067) regardless of parents' age or educational level or working status. However, there was a significant association between increased monthly family income (higher than 10,000 S.R) (p<0.0001), increased number of children (p=0.0313), previous history of dentist visits (p=0.0178), higher frequency of dentist visit/year (p=0.0117), history of orthodontist visits (p=0.0068) and history of previous orthodontic treatment (p=0.0022) with the higher level of parents' acceptance towards interceptive orthodontic treatment (Table 3).

Demographic	Malocclusi	on awarene	(%) SS							Habits awa	reness (%)			
Data	Single tooth anterior crossbite	Skeletal class II	Severe Iower incisors crowding	Anterior open bite	Posterior crossbite	Skeletal class III- frontal view	Skeletal class III- side view	Deep overbite	Overall malocclusion Mean (SD)	Thumb sucking after age of 6	Pacifier sucking after age of 6	Mouth breathing	Tongue thrusting	Overall habits Mean (SD)
Gender														
Male	27.31 *	27.10*	26.59*	26.56*	27.27	25.38*	27.38	27.41	6.8 (1.7)*	26.01*	26.32*	26.54	26.96	2.8(1.2)*
Female	72.69 *	72.90*	73.41*	73.44*	72.73	74.62*	72.62	72.59	7.2 (1.3)*	73.99*	73.68*	73.46	73.04	3.0(1.0)*
Age														
30 or below	18.40	18.83	18.03	18.92	17.80*	18.72	19.06	18.15*	7.0 (1.6)*	18.88	19.74*	20.11	19.13*	3.0(1.1)*
31-40	37.36	36.97	37.92	36.78	36.49*	38.94	36.78	36.04*	7.0 (1.5)*	36.70	34.91*	34.32	35.69*	2.8(1.1)*
Above 40	44.24	44.20	44.05	44.30	45.71*	42.34	44.16	45.81*	7.3 (1.3)*	44.42	45.35*	45.58	45.19*	3.0(1.0)*
Educational level														
High school or less/Not-edu- cated	20.77	20.90	20.81	20.68	20.83	19.72	20.27	20.56	7.0 (1.6)	20.43	20.74	22.79*	21.05	2.9(1.1)
Bach- elor degree/ diploma	64.79	64.75	64.86	64.75	64.52	65.83	64.56	65.10	7.1 (1.5)	65.68	64.95	59.79*	64.96	2.9(1.0)
Master/doctor- ate degree	14.45	14.35	14.34	14.57	14.65	14.45	15.17	14.34	7.3 (1.1)	13.90	14.31	17.43*	13.99	3.0(1.1)
Working Status														
Working	52.71	52.58	52.25	52.88	53.79*	52.89	52.48	53.55	7.2 (1.3)	52.73	52.36	52.01	52.50	2.9(1.0)
Not- working	47.29	47.42	47.75	47.12	46.21*	47.11	47.52	46.45	7.1 (1.5)	47.27	47.64	47.99	47.50	2.9(1.1)
Monthly family incc	me													
Less than 5000 SR	11.51*	12.06	11.68	11.99*	11.24	10.93*	11.14*	10.53*	6.8 (1.7)*	12.11*	11.30	12.33	12.45	3.0(1.1)*
5001-10,000 SR	31.04*	30.65	31.33	29.73*	30.93	30.90*	30.07*	31.35*	7.0 (1.6)*	30.29*	30.62	27.61	30.04	2.8(1.1)*
10,001– 20,000 SR	32.62*	32.49	32.83	33.61*	33.33	32.04*	33.02*	33.25*	7.3 (1.2)*	33.49*	32.90	34.05	32.35	3.0(1.0)*
More than 20,000 SR	24.83*	24.80	24.16	24.68*	24.49	26.13*	25.77*	24.87*	7.3 (1.2)*	24.11*	25.18	26.01	25.16	3.0(1.0)*
Number of children														
1-2	25.40	25.26*	25.09	25.26*	25.00*	26.26	25.37	24.75	7.0 (1.6)	25.06	25.04	21.18*	25.29	2.8(1.1)*
3-4	34.76	34.21*	35.26	33.96*	33.33*	34.42	34.09	34.14	7.0 (1.6)	34.44	33.91	34.32*	33.76	2.8(1.1)*
More than 4	39.84	40.53*	39.65	40.78*	41.67*	39.32	40.54	41.12	7.3 (1.2)	40.50	41.06	44.50*	40.95	3.1(1.0)*
History of dentist vi	sits													
Yes	86.00	85.65	86.13	86.13	86.11	85.93	86.44	86.04	7.2 (1.4)	85.99	85.55	87.40	85.75	2.9(1.1)
No	14.00	14.35	13.87	13.87	13.89	14.07	13.56	13.96	7.0 (1.6)	14.01	14.45	12.60	14.25	2.9(1.1)

 Table 2
 Parents' awareness in relation to demographic data

Table 2 (contir	nued)													
Demographic	Malocclus	ion awarene	(%) ssa							Habits awa	areness (%)			
2	Single tooth anterior crossbite	Skeletal class II	Severe lower incisors crowding	Anterior open bite	Posterior crossbite	Skeletal class III- frontal view	Skeletal class III- side view	Deep overbite	Overall malocclusion Mean (SD)	Thumb sucking after age of 6	Pacifier sucking after age of 6	Mouth breathing	Tongue thrusting	Overall habits Mean (SD)
Number of dentis	t visits/year													
Once	26.25	26.14	25.91	25.92	25.95	27.05	25.47	26.40*	7.1 (1.5)	25.28	25.25	23.93	25.75	2.8(1.2)*
Twice	29.53	29.62	30.47	29.74	28.89	29.82	29.04	28.17*	7.1 (1.5)	29.97	28.93	27.91	28.74	2.8(1.1)*
More than twice	44.23	44.24	43.62	44.34	45.16	43.13	45.50	45.43*	7.3 (1.2)	44.75	45.82	48.16	45.51	3.1(1.0)*
Age of the child c	on the first der	ntal visit												
6 years and below	53.67	53.35	54.09	53.48	52.79	53.95	54.35	52.80	7.1 (1.5)	54.01	53.01	54.29	54.19	2.9(1.0)
7–9 years	24.02	24.13	24.03	24.15	24.05	24.71	22.67	24.34	7.2 (1.2)	23.90	24.58	23.31	23.80	2.9(1.0)
10–12 years	10.10	10.19	10.07	10.10	10.56	9.94	10.71	10.18	7.2 (1.5)	10.22	9.70	10.43	10.18	2.9(1.2)
13 years and above	12.20	12.33	11.81	12.28	12.61	11.40	12.27	12.68	7.2 (1.3)	11.88	12.71	11.96	11.83	2.9(1.1)
History of orthod	ontist visits													
Yes	51.13	50.98	51.21	51.12	52.40	50.63	52.08	52.41*	7.2 (1.3)*	51.66	51.65	54.96*	52.89*	3.0(1.0)*
No	48.87	49.02	48.79	48.88	47.60	49.37	47.92	47.59*	7.0 (1.5)*	48.34	48.35	45.04*	47.11*	2.8(1.1)*
History of previou	is orthodontic	: treatment												
Yes	42.33	42.02	41.85	42.30	43.43	41.46	43.36	43.65*	7.3 (1.3)*	42.76	44.21*	47.45*	43.65*	3.1(1.0)*
No	57.67	57.98	58.15	57.70	56.57	58.54	56.64	56.35*	7.0 (1.5)*	57.24	55.79*	52.55*	56.35*	2.8(1.1)*
*p ≤ 0.05														

Table 3 Parents' acceptance (%) in relation to demographic data

Demographic Data	Acceptance (%)
Gender	
Male	27.33*
Female	72.67*
Age	
30 or below	18.33
31–40	37.78
Above 40	43.89
Educational level	
High school or less/ Not-educated	20.67
Bachelor degree/diploma	65.00
Master/doctorate degree	14.33
Working Status	
Working	52.78
Not- working	47.22
Monthly family income	
Less than 5000 SR	10.89*
5001–10,000 SR	31.78*
10,001–20,000 SR	32.78*
More than 20,000 SR	24.56*
Number of children	
1–2	25.00*
3–4	35.11*
More than 4	39.89*
History of dentist visits	
Yes	86.22*
No	13.78*
Number of dentist visits/year	
Once	25.77*
Twice	29.77*
More than twice	44.46*
Age of the child on the first dental visit	
6 years and below	53.48
7–9 years	23.97
10–12 years	10.44
13 years and above	12.11
History of orthodontist visits	
Yes	51.44*
No	48.56*
History of previous orthodontic treatment	
Yes	42.67*
No	57.33*

*P-value \leq 0.05

Discussion

The American Association of Orthodontics recommends that children should be first evaluated by an orthodontist at the age of seven to determine the need for any orthodontic procedure [20]. According to a systematic review published in 2020, the global prevalence of malocclusion among children and adolescents was 56%. In primary and mixed dentition, Class I malocclusion was the most common, followed by Class II and Class III malocclusion. In terms of vertical malocclusions, normal bite was the most common, followed by deep bite and open bite. More than half of children with primary or mixed dentition had some form of transverse malocclusion, such as crossbite, posterior crossbite, scissorbite, or midline shift [20].

In Saudi Arabia, the most common malocclusion traits among school children in the southern region of the country were crowding, spacing, increased overjet, increased overbite, posterior crossbite, and anterior open bite, according to a study conducted in 2019 [21]. Another study in the northern border region of Saudi Arabia found that the most prevalent malocclusions, in order of prevalence, were Angle's Class I, Angle's Class II, Angle's Class II, Angle's Class III, crowding, excessive overjet, reduced overjet, excessive overbite, reduced overbite, anterior crossbite, posterior crossbite, and open bite [22].

Parental awareness of their children's oral health conditions is a vital factor in the mitigation and prevention of malocclusion [23]. The impact of malocclusion on the healthcare system in Saudi Arabia has been extensively documented in a systematic review of 26 studies, revealing a prevalence rate of 72% among the Saudi Arabian population [24, 25]. Given the significance of preventive and interceptive orthodontic interventions in addressing malocclusions, it becomes imperative to evaluate the level of parental awareness regarding these conditions. Notably, prior research conducted in Saudi Arabia lacked visual demonstrations, which our study aimed to rectify by incorporating photos of eight types of malocclusions and four types of habits in our questionnaire. The study findings indicate that parents exhibited the highest level of awareness in identifying single anterior tooth crossbite (95.78%), whereas their awareness regarding the lateral view of skeletal Class III was relatively lower (80.54%).

Regarding gender differences, recent studies in Saudi Arabia reported contradictory findings [4, 23]. Aljehani et al. found that males exhibited greater knowledge than

females (p < 0.001), contrasting with our study's results [23]. Conversely, Alharbi et al. reported that females had higher awareness than males (p=0.174) aligning with our study's findings (p=0.0012) [4]. Educational level did not show a correlation with parents' awareness in our study, but both Aljehani et al. (p<0.001) and Alsaggaf et al. (p < 0.001) reported significantly higher awareness among parents with higher educational qualifications [5, 23]. These variations can be attributed to the personal experiences of the participants. Moreover, the geographic distribution can cause such variations in results, as all the studies were conducted in different regions in Saudi Arabia. Our study identified a positive correlation between increasing age, higher income, history of orthodontic visits, previous history of orthodontic treatment, and parents' awareness of malocclusion.

Limited studies have been found to assess parents' awareness regarding the negative effects of oral habits. In accordance with Alharbi et al. and Ansari et al. parents were aware that oral habits such as thumb sucking, pacifier sucking, tongue thrusting, and mouth breathing can cause a malocclusion, but their results were not correlated with gender, income, age, number of children, history of previous orthodontic treatment or visits [4, 26]. On the contrary in our study; we have found that mothers were more aware than fathers (p=0.04), and higher awareness among older (p=0.0019) and higher income parents (p=0.05). In addition, an increased number of children (p = 0.0103), an increased number of dentist visits/ year (p = 0.019), a history of orthodontist visits (p=0.006) and previous history of orthodontic treatment (p = 0.0002) has a positive relation with parents' awareness level. The variations in parental responses observed between this study and the two previous studies by Alharbi et al. and Ansari et al. can be explained by several factors [4, 26]. These factors encompass distinctions in parental characteristics, differences in the questionnaire's content, the incorporation of visual figures in our questionnaire, a unique feature absent in the other studies.

The results of our study revealed that early intervention acceptance was found to be very high, higher than 97% among participating parents. It was found that mothers were more inclined than fathers to accept interceptive treatments (p=0.0067) regardless of parents' age or educational level or working status. However, there was a significant association between increased monthly family income (higher than 10,000 S.R) (p<0.0001), increased number of children (p=0.0313), previous history of dentist visits (p=0.0178), higher frequency of dentist visit/year (p=0.0117), history of orthodontist visits (p=0.0068) and history of previous orthodontic treatment (p=0.0022) with the higher level of parents' acceptance towards interceptive orthodontic treatment. No study has been found to assess parents' acceptance of preventive and interceptive orthodontic treatment.

The limitations of previous studies including the use of small sample size and lack of key demographic data limited their generalizability [6, 27]. However, this study has its fair share of unintentional limitations. The use of self-reported survey, which are inherently subjective, might introduce social desirability bias where participants provide socially acceptable answeres rather than reflecting their own knowledge. To address these issues, visual demonstrations of different malocclusions/habits where used to reduce the subjectivity in answering the questionnaire and accurately measure the parents' awareness and acceptance. In addition, the participating mothers were higher than fathers, and most of the participants were above the age of 30, educated and working which might affect the result of this study directly or indirectly.

Conclusion

The majority of the parents had a high level of knowledge and were willing to seek early treatment. The highest knowledge among malocclusion traits was found in single anterior tooth crossbite, and the lowest in skeletal class III side view. On the other hand, the highest knowledge of oral habits was found to be thumb sucking, and the lowest was mouth breathing. This favourable attitude and knowledge is, in turn, encouraging for the future prevention of malocclusion severity and ease of treatment.

Appendix

	المملكة العربية السعودية وزارة الحرس الوطني – الشؤون الصحية
Informed Consent for Cross Sectional Surveys	إقرار موافقة للمشاركة بدراسة مقطعية
Study Title : Parents Awareness and Acceptance Towards	Preventive and Interceptive Orthodontic Treatment
Study No. : SP21R-399-08	
Principal Investigator : Dr. Samah Alfuriji	
You are requested to participate in research that will be supervised by (Dr. Samah Alfuriji) in (College of Dentistry, King Saud bin Abdulaziz University for Health Sciences).	أنت مدعو للانضمام طواعية لدارسة بحثية سوف يشرف عليها (د. سماح الفريجي) في (كلية طب الأسنان، جامعة الملك سعود بن عبدالعزيز للعلوم الصحية)
This study is about (assessing parents' awareness towards preventive and interceptive orthodontic treatment).	هذه الدراسة تهدف إلى (قياس مدى الوعي لدى الأمهات والأباء السعوديين تجاه علاج تقويم الأسنان المبكر)
Your participation is voluntary, and you have the right to not complete this survey without giving any reason and this will not affect your current or future medical care in MNG-HA.	إن مشاركتك في هذه الدراسة طوعية ولك الحق التام في عدم قبول تعبئة الاستمارة أو الانسحاب في أي وقت تشاء بدون ابداء الاسباب ولن يؤثر ذلك على العناية الطبية المقدمة لك حالياً أو في المستقبل في الشؤون الصحية بوزارة الحرس الوطني.
You do not have to sign this information sheet only you can choose to agree/disagree; your acceptance to complete the survey will be interpreted as your informed consent to participate.	لا يجب عليك التوقيع على ورقة المعلومات هذه، فقط عليك الاختيار موافق / غير موافق فمجرد قبولك تعبئة هذا الاستبيان يعتبر بمثابة إقرارك بالموافقة على المشاركة في هذا البحث.
Your responses will be kept anonymous. However, whenever one works with email/the internet there is always the risk of compromising privacy, confidentiality, and/or anonymity. Despite this possibility, the risks to your physical, emotional, social, professional, or financial well-being are considered to be 'less than minimal'.	ستبقى الردود على الأسئلة سرية ومع ذلك، فإن العمل عن طريق البريد الالكتروني والانترنت يبقى هناك احتمال الاختراق خصوصية البيانات وسرية المعلومات ولكن بالرغم من هذه الاحتمالية تبقى الاخطار البدنية والعاطفية والاجتماعية والمهنية والمالية المترتبة عليك ضمن الحد الادنى من الخطورة.
If you have any questions about the research, please contact (Dr. Samah Alfuriji- College of Dentistry, King Saud bin Abdulaziz University for Health Sciences). Contact information: phone no. +966114299999 Ext. 95861, E-mail: furijis@ksau-hs.edu.sa	إذا كان لديك أي اسئلة حول هذا البحث، يرجى الاتصال (د. سماح الفريجي -كلية طب الأسنان، جامعة الملك سعود بن عبدالعزيز للعلوم الصحية) على رقم الهاتف: ١٤٢٩٩٩٩٩ + ٣٦٦١ (٢٩٩٩٩ او عن طريق البريد الاليكتروني: furijis@ksau-hs.edu.sa
In case you have any enquiries related to your rights as a research subject you can contact the Institutional Review Board on Tel 8011111 Ext. 14572.	في حال كان لديك الاستفسارات المتعلقة بحقوقك كموضوع بحث يمكنك الانصال بمجلس المراجعة المؤسسية على هاتف 801111 تحويلة 14572
Agree to participate Disagree to participate	☐ موافق على المشاركة ☐ غير موافق على المشاركة
Version No. :	Version Date:
Non-Clinical Form Rev. 11/2014 Ref# APP 1419-05 Page 1 c	of 1 Appendix J 0&M # 2101-1054

A. Parents' Demographic Data:

Nationality:					
🗆 Saudi			□ Non-	saudi	
Gender: □ Male			🗆 Fema	le	
Age: □ 30 or below			□ 31-40)	□ Above 40
Educational level: □ High school or less/n degree	ot educate	ed	Bach	elor degree/diploma	□ Master/doctorate
Working status:			🗆 Not-v	vorking	
Monthly family incom Less than 5,000 SR SR	e:	□ 5,001-10,000 \$	šR.	□ 10,001-20,000 SR	□ More than 20,000
How many children (s	ons/daug D 3-4	hters) do you hav	e? □ More	than 4	
Have any of your child	lren visit	ed a dentist befor	e?		
□ Yes	🗆 No				
If yes, how many time	s per year	r?			
□ Once	Twice		fore than	twice	
If yes, at which age ha □ 6 years and below	ve your c	hild visitied the d □ 7-9 years old	lentist fo	r the first time? □ 10-12 years old	□ 13 years and above
Have any of your child	lren visit	ed an orthodontis	t before	?	
□ Yes	🗆 No				
Did any of your childr	en reciev	e an orthodontic	treatme	at previously?	
🗆 Yes	🗆 No				

B. Parents' Knowledge of Malocclusion and Habits:

Do you think this condition is a problem and needs an early orthodontic intervention?

Single Tooth Ante	erior Crossbite	Mild C	rowding	Cla	uss II
U Yes		• Yes	- No	C Yes	_ No
Normal S	pacing	Sever C	rowding	Anterior	Open Bite
No.	1414	C-	R)	And a	
🗆 Yes	D No	🗆 Yes	🗆 No	🗆 Yes	🗆 No
Normal Al	ignment	Posterior	Crossbite	Class III (A	nterior View)
	D		·		MANY
🗆 Yes	🗆 No	🗆 Yes	🗆 No	🗆 Yes	🗆 No
Normal Oc	cclusion	Class III (L	ateral View)	Dee	p Bite
*	X- 4-		-	Spe	-
🗆 Yes	🗆 No	🗆 Yes	🗆 No	🗆 Yes	🗆 No

Do you think this habit cause malocclusion?



C. Parents' Treatment Acceptance:

-							
At which age you will consider taking your child to the dentist for the first time?							
At which age you will consider taking your child to the orthodontist for the first time?							
\Box 6 years and below	□ 7-9 years old	□ 10-12 years old	\square 13 years and above				
If you know that some of you considered going to	f the previous conditions are seek interceptive orthodontic	problematic and need early i treatment?	intervention, would				
🗆 Yes	🗆 No						
If the answer for the previous question is yes, then why? (you can select multiple answers)							
□ Improve esthetic and child confidence							
Improve the function							
Avoid social stigma							
Prevent the need of more complicated treatment or surgery which will cost more							
The dentist recommended it							
\Box I have problems with r	ny teeth and I don't want my ch	nild to have problems					
Others:							
If the answer for the pr	evious question is no, then wh	y? (you can select multiple a	nswers)				
I don't think orthodont	ic treatment is important or nec	cessary					
□ High cost							
Takes a long time							
□ It's better to wait for a	ll the permanent teeth to erupt t	hen starts the orthodontic treat	ment				

- □ Pain inflected in the first few weeks of the orthodontic treatment
- Others: -----

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Author contributions

Conceptualization, Samah Alfuriji; Data curation, Samah Alfuriji, Maram Albalawi, Ghaida Alnaqa, Kwlood Alrufayyiq, Maha Alharbi, Dania Aljeaid and Shug Albarrak; Formal analysis, Samah Alfuriji and Maram Albalawi; Investigation, Samah Alfuriji, Ghaida Alnaqa, Kwlood Alrufayyiq, Maha Alharbi, Dania Aljeaid and Shug Albarrak; Methodology, Samah Alfuriji, Adeem Alofi, Maram Albalawi, Ghaida Alnaqa, Kwlood Alrufayyiq, Maha Alharbi, Dania Aljeaid and Shug Albarrak; Project administration, Samah Alfuriji; Software, Maram Albalawi, Supervision, Samah Alfuriji and Adeem Alofi; Validation, Samah Alfuriji; Visualization, Samah Alfuriji and Adeem Alofi; Writing—original draft, Samah Alfuriji, Ghaida Alnaqa, Kwlood Alrufayyiq, Maha Alharbi, Dania Aljeaid and Shug Albarrak; Writing—review & editing, Samah Alfuriji, Adeem Alofi, Ghaida Alnaqa, Kwlood Alrufayyiq, Maha Alharbi, Dania Aljeaid and Shug Albarrak; Writing—review & editing, Samah Alfuriji, Adeem Alofi, Ghaida Alnaqa, Kwlood Alrufayyiq, Maha Alharbi, Dania Aljeaid and Shug Albarrak.

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Availability of data and materials

No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate

The ethical approval for conducting the study was obtained from the Institutional Review Board at the King Abdullah International Medical Research Center-KAIMRC (SP21R/399/08) (IRB approval memo attached in related files). Informed consent was obtained from all individual participants (parents) included in the study (a copy of the informed consent is attached in related files and added to the Appendix).

Consent for publication

The participant has consented to submit the article to the journal.

Competing interests

The authors declare no competing interests.

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