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Space Maintainers: Knowledge and Awareness among Saudi Adult Population

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Abstract:

Background: Space maintenance is a critical process in the developing dentition as a preventive measure for multiple malocclusion problems related to the loss of arch length. The aim of this study was to assess the level of adults' awareness toward space maintainers in Saudi Arabia.

Materials and Methods: An online survey was conducted from January to May 2015. The questionnaire consisted of 19 multiple-choice questions assessing four main categories; (a) Demographic data, (b) oral health knowledge regarding brushing behaviors and dental check-ups, (c) previous experience with early loss of primary teeth and space maintainers, and (d) awareness toward the uses and maintenance of space maintainers. Descriptive statistics and correlations were conducted using SPSS (V16.0). Significance level was set at $P < 0.05$.

Result: Out of 600 completed questionnaires collected, 77.3% were males, 94% Saudi majority from provinces in western region. Private dental clinics were the most visited clinics for children care (71%). A higher percent of respondents (72.7%) showed unsatisfactory level of knowledge toward the importance of regular dental visits for children and 88.3% showed satisfactory level of knowledge toward the role of parents in supporting children in their brushing. Moreover, satisfactory level of awareness was found in the followings; the need for special brushing care with space maintainers (74%), management of broken or lost space maintainers (68.7%), and the best time to visit the dentist for lost space maintainers (69.8%). Oral health knowledge and awareness levels showed significant correlations with some demographic and previous experience variables ($P < 0.05$).

Conclusion: The level of knowledge and awareness about the usage, maintenance, and advantages of space maintainers among Saudi adults population is very low, as a result the deleterious effects of neglected lost primary teeth.

***Key Words*:** Awareness, children, early loss of primary teeth, Saudi Arabia, space maintainers

Introduction

The number of children affected by malocclusion due to premature loss of primary teeth has increased significantly and is considered one of the most common dental problems together with dental caries, gingival disease, and dental fluorosis.[1,2] Treatment of malocclusion comprises corrective as well as preventive measures. Preventive measures are done in the primary or early mixed dentition, when the first signs of occlusal mal-development are recognized.[3]

The introduction of mixed dentition orthodontic treatment, which aims to reduce or prevent the severity of malocclusion, is of big challenge to orthodontists. Early detection and appropriate referral of cases requiring preventive and interceptive orthodontic treatments are important. It will eliminate or reduce the severity of a developing malocclusion, complexity of treatment, and overall treatment time and cost. It will also improve the self-esteem of the subject and parental satisfaction.[3,4] Among the preventive measures is "Space maintenance" using certain appliances called "Space maintainers." Space maintainers are fixed or removable appliances used to preserve arch length following the premature loss or elective extraction of primary tooth.[5] Space maintenance is a critical process in the developing dentition. The loss of arch length may lead to multiple problems such as crowding, ectopic eruption, dental impaction, cross bite formation, and dental centerline discrepancies. Thus, the use of space maintainers often affects the future dental needs of a complex orthodontic treatment as it may potentially obviate the need for later extractions.[4]

The pediatric dentist plays an equally important role in the follow-up and awareness of oral health for the young patients and their parents. Proper patient education, regular check-ups, and follow ups as well as improving public awareness about the maintenance and care of the primary and mixed dentition, especially with cases of fixed appliances as well as space maintainers are major responsibilities of the pediatric dentist.[6,7]

Parents, on the other hand, play an equally important role in the care and decision making regarding the health care for their

children. Nagarajappa *et al*. reported that the actual disease and perceived needs for treatment are associated significantly with parent's perceptions and awareness of their children's oral health. Therefore, it is expected that the parents' knowledge and awareness on oral health prevention would influence their children's behavior in adapting preventive oral health practices. It is also expected that the lack of awareness among school children, parents, and primary-care personnel may result in patients not being referred for timely interceptive intervention.[4,8-11]

A study was conducted in Saudi Arabia, by Alshehri and Nasim in 2015, assessing the knowledge and awareness of parents about their infants' oral health care in Abha region. They found that out of 323 parents, only 77 participants (25.33%) had a good knowledge about the health of their kid's mouth. They further reported that the children were more exposed to medical care but not dental care at early age, and that parents in Saudi Arabia have insufficient knowledge and wrong behavioral habits toward their kids' oral health.[8]

The aim of this study was to assess the level of awareness of adults toward space maintainers as a preventive measure for oral health in Saudi Arabia. Findings will help guide and direct the dental public health professionals as well as responsible bodies to invest in the proper measures for supporting and increasing awareness toward oral health, specifically space maintenance, in Saudi Arabia.

Materials and Methods

A cross-sectional survey with a structured questionnaire was designed based on a thorough review of the literature, written in Arabic language and distributed using an online survey platform with an attempt to include different regions of Saudi Arabia. The questionnaire was designed to have all fields with "required responses," so that the respondent cannot move to the next question without answering the previous one. Thus, none of the received questionnaires had missing data or were excluded. The period of data collection extended from January 2015 to May 2015. Ethical approval was obtained from the Research Ethics Committee of the Faculty of Dentistry at King Abdulaziz University, Jeddah, Saudi Arabia.

The questionnaire consisted of 19 multiple-choice questions assessing four main categories; (a) Demographic data, (b) oral health knowledge regarding brushing behaviors and dental check-ups, (c) previous experience to early loss of primary teeth and space maintainers of related children, and (d) awareness toward the uses and maintenance of space maintainers.

The demographic data included age, gender, marital status, nationality, place of residence (regions), educational level, specialty background (from the health professional fields or not), income, and the most frequently visited dental clinics for their children.

The oral health knowledge section had two multiple-choice questions that were designed to assess the knowledge toward the frequency of required dental visits for children and the role of parents in supporting children during brushing. The previous experience section had two multiple-choice questions that were designed to assess the participants' previous experience with early loss of primary teeth as well as with the previous exposure to space maintainers. The last section consisted of six multiple-choice questions assessing the uses, care, and maintenance of space maintainers.

All multiple-choice questions had more than one correct answer. Accordingly, the knowledge as well as the awareness levels were scored, based on the percentages of correct answers as follows;

- 1 = Satisfactory level (when the respondents chose ≥50-100% of the correct answers),
- 2 = Unsatisfactory level (when the respondents chose <50% of the correct answers).

Descriptive statistics were used to report the demographic distribution, oral health knowledge level, previous experience, as well as awareness level toward space maintainers. Pearson correlations were further conducted to assess the association of both knowledge as well as the awareness levels with some variables hypothesized to have an impact on this matter. Those variables were gender, marital status, age, educational level, specialty, income, and the previous experience variables. Normality was assumed using Levene's test for homogeneity of variance. Significance level was set at ($P < 0.05$). Data were processed and analyzed using Excel (Microsoft Excel, Version 2013) and SPSS version 16.0 programs.

Results

A total of 600 questionnaires were obtained and all with complete answers; thus yielded 100% response rate. The study population comprised 77.3% males and only 22.67% females. Most of the respondents were Saudi (94%) in which 43% were from the western region. Out of the total sample, 70.3% aged between 25 and 40 years old, 72.5% were married, and 70.3% had an educational degree at university level or above. Almost half of the respondents (65.7%) were not from the health professional field, and 57.2% belonged to medium-low socioeconomic status (Table 1).

The most commonly visited clinics for children's dental treatment was the private dental clinics (71%), whereas only 30.7% visited ministry hospitals, (9.8%) visited university hospitals, and the least 9.2% visited military hospitals (Graph 1).

In regards to oral health knowledge, 72.7% of the respondents showed unsatisfactory level of knowledge toward the importance of regular dental visits for children. On the other hand, 88.3% showed a satisfactory level of knowledge toward the role of parents in supporting children during their brushing (Graph 2).

Respondents' previous experience to early loss of primary in children was as follows; 27.8% had experience, 58.5% did not have experience, and 13.7% of parents were not aware of such condition happened to their or any related children. In regards to previous experience to space maintainers for children, respondents reported the followings; 12.8% had previous experience, 75.2% had no experience, and the remaining 12% were not aware if their or any related children were ever treated with space maintainers (Table 2).

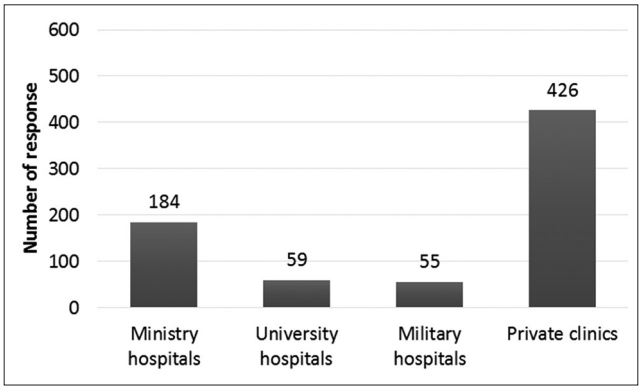
The level of respondents' awareness toward space maintainers showed varied results. More than half of the respondents showed unsatisfactory level of awareness in the followings; the timing of space maintainer usage (57.5%), the types of food that should be avoided when having space maintainers (60.7%), and the frequency of dental follow-ups when having space maintainers (56.8%). On the other hand, more than half of the respondents showed satisfactory level of awareness in the followings; the need for special brushing care with space maintainers (74%), management of broken or lost space maintainers by parents (68.7%), and the best time to visit the dentist in the latter situation (69.8%) (Graph 3).

Table 1: Sample distribution.

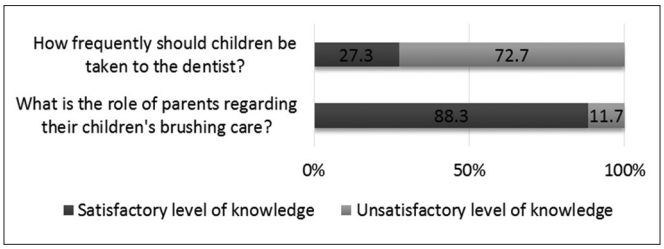
Variables	*N*=600 (%)
Gender	
Male	464 (77.33)
Female	136 (22.67)
Marital status	
Single	165 (27.50)
Married	435 (72.50)
Nationality	
Saudi	564 (94.00)
Non-Saudi	36 (6.00)
Age (years)	
<25	85 (14.17)
25-40	422 (70.33)
41-60	89 (14.83)
More than 60	4 (0.67)
Educational level	
High school	178 (29.67)
University	358 (59.67)
Higher education	64 (10.67)
Specialty	
Health professional field	206 (34.33)
Other fields	394 (65.67)
Income	
Low (<5000 SR)	120 (20.00)
Medium-low (5000-15,000 SR)	343 (57.17)
Medium-high (15,000-25,000 SR)	95 (15.83)
High (more than 25,000 SR)	42 (7.00)
Provinces	
Center	140 (23.33)
West	258 (43.00)
East	57 (9.00)
North	53 (8.83)
South	82 (13.67)
Others	10 (1.67)

Pearson correlation was further conducted to assess the association of knowledge as well as the awareness levels with some of the demographic data and the previous experience variables. Results indicated a significant correlation ($P < 0.05$) between the following variables (Tables 3 and 4);

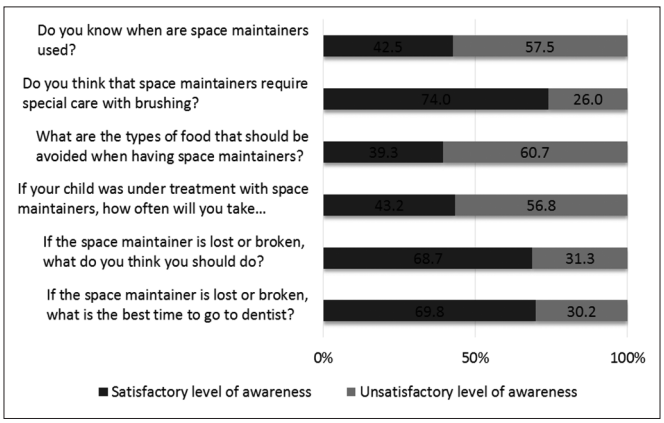
- Gender was significantly correlated with all variables used to assess oral health knowledge and awareness levels except with the variable used for assessing the awareness for space maintainer uses ($P > 0.05$)
- Marital status was significantly correlated with all variables used to assess oral health knowledge as well as the awareness toward the types of food that should be avoided when having space maintainers only ($P < 0.05$)



Graph 1: Frequency of responses toward the different types of visited clinics for children's dental treatment in Saudi Arabia.



Graph 2: Respondents' knowledge level toward oral health care of their related children.



Graph 3: Respondents' level of awareness toward space maintainers.

- Age was significantly correlated with two variables only; (1) How frequently should children be taken to the dentist, and (2) the awareness toward the types of food that should be avoided when having space maintainers
- Educational level was significantly correlated with two awareness variables only; (1) When should space maintainers be used, (2) in case the child was under treatment with space maintainers, how often will be the visits to the dentists
- Specialty was significantly correlated with all variables used to assess oral health knowledge and awareness levels but with no correlation with the variable used for assessing the knowledge toward the role of parental support in brushing care ($P > 0.05$)
- Income was significantly correlated with all variables used to assess oral health knowledge level, but only with two variables assessing awareness level which were; (1) When should space maintainers be used, (2) if the space maintainer was lost or broken, what would be the best time to go to the dentist
- Previous experience to early loss of primary teeth was only correlated with the variable used to assess the awareness toward space maintainers' uses
- Previous experience to space maintainers was significantly correlated with all variables used to assess oral health knowledge but with only two variables used for assessing the awareness level; (1) When should space maintainers be used, and (2) the types of food that should be avoided when having space maintainers.

Discussion

The study showed that the respondents have an adequate access to dental health care all over the Kingdom with more than half of the respondent preferred private dental clinics

Table 2: Respondent's previous experience with early loss of primary teeth and the use of space maintainers in children.

Variables	*N* (%)
Did your (or relatives) child lose any of his primary teeth due to caries, abscess, or trauma?	
Yes	167 (27.8)
No	351 (58.5)
I don't know	82 (13.7)
Have your (or relatives) child ever been treated with any of the following space maintainers? (Images of space maintainers were presented in the questionnaire)	
Yes	77 (12.8)
No	451 (75.2)
I don't know	72 (12.0)

Table 3: Correlations between respondents' oral health knowledge and the demographic data and previous experience variables.

Predictors	Oral health knowledge variables (*P* value)	
	How frequently should children be taken to the dentist?	What is the role of the parents regarding their children brushing care?
Demographic variables		
Gender	0.032*	0.000***
Marital status	0.002*	0.005**
Age	0.008**	0.416
Education level	0.781	0.785
Specialty	0.000***	0.102
Income	0.039*	0.024*
Previous experience variables		
Did your child (or relatives) lose any teeth due to caries or trauma?	0.584	0.987
Have you ever had your (or relatives) child treated with space maintainers?	0.000***	0.000***

Significant using pearson correlation test at *P<0.05, **P<0.01, and ***P<0.001 level

Table 4: Correlations between respondents' awareness toward space maintainers and the demographic data and previous experience variables.

Predictors	Awareness toward space maintainers variables (*P* value)					
	Do you know when space maintainers are used?	What are the types of food that should be avoided when having space maintainers?	Do you think that space maintainers require special care with brushing?	In case your child is under treatment with space maintainers, how often will be the visits to the dentists?	If the space maintainer is lost or broken, what do you think you have to do?	If the space maintainer is lost or broken, what is the best time to go to dentist?
Demographic variables						
Gender	0.070	0.000***	0.003**	0.000***	0.000***	0.011*
Marital status	0.729	0.001**	0.983	0.609	0.798	0.658
Age	0.650	0.013*	0.984	0.576	0.906	0.594
Education level	0.000***	0.280	0.058	0.002**	0.634	0.265
Specialty	0.000***	0.000***	0.000***	0.000***	0.000***	0.007**
Income	0.000***	0.690	0.226	0.498	0.407	0.041*
Previous experience variables						
Did your (or relatives) child lose any teeth due to caries or trauma?	0.000***	0.544	0.564	0.665	0.849	0.108
Have you ever had your (or relatives) child treated with space maintainers?	0.000***	0.000***	0.751	0.034*	0.247	0.790

Significant using pearson correlation test at *P<0.05, **P<0.01, and ***P<0.001 level

rather than ministry, university, or military hospitals. It is also appreciable that the adult respondents in our study were relatively knowledgeable about their role to the brushing care of children. Surprisingly, however, only few of the current study samples knew how frequently children should be taken to the dentist and the importance of regular dental visits. The current findings support multiple studies conducted in Saudi Arabia assessing parents' awareness toward children dental care from two perspectives.[8,12-15] The high level of awareness and parents care for their children in Saudi Arabia was confirmed by Alshehri and Nasim in 2015. He also showed that parents prefer high quality dental services.[8] However, according to the report by the Ministry of Health, Kingdom of Saudi Arabia; the percentage of children aging six and twelve, suffering from tooth decay in the Kingdom reached 96% and 93.7%, respectively.[14] Moreover, several studies showed that the prevalence and severity of caries in children in the kingdom is relatively high[12,13,15] as well as that of young adult.[16] This highlights the second perspective in which parents' care and perception still did not seem to be properly reflected in their attitude and management of their children dental care. The lack of awareness toward the deleterious effect of unmanaged early lost primary teeth on the dentition and, thus, the importance of regular dental visits could be a factor.

Limited studies have been reported in the literature assessing parents' awareness toward the management of early loss of primary teeth and the use of space maintainers and with limited depth.[9,11] Accordingly, there were no available data to compare with for this issue. The current findings showed low level of experience with space maintainers as well as unsatisfactory levels of awareness to the management of lost primary teeth, the uses of space maintainers, as well as the care and maintenance of space maintainers. Borrie *et al*. by a random sample of 400 general dental practitioners in Scotland significantly found that the greatest barrier in providing interceptive orthodontic care was the practitioners' lack of self-confidence in their chosen treatment plan.[9] Interceptive treatment seems to be a challenging condition for both general dental practitioners as well as parents. Talekar *et al*. found that only half of their assessed population, who reported having children lost their primary teeth due to caries, abscess or trauma, was treated with space maintainers; with no further data to explain the management taken for such cases. They emphasized in their study that parental awareness and perception had a significant impact on children oral health and treatment received.[11] Similar findings were reported in the current study as half of the respondents had previous experience with early lost primary teeth with children, but only few reported having experience with space maintainers.

Space maintainers require special attention in terms of care, maintenance, regular dental visits, and follow up. Space maintainers are liable to fracture, impinge on the oral mucosa or interfere with the eruption of adjacent teeth, as well as attract plaque that could lead to inflammation.[5] The majority of our respondents knew that space maintainers require special care with brushing, and how to manage if they were lost or broken. However, an unsatisfactory level of awareness was reported in the understanding of the importance of regular dental visits and follow up, especially when the child have early lost primary tooth or a space maintainer. The knowledge level in such matter was found in this study to be correlated with gender, marital status, age, specialty, and socioeconomic status. The socioeconomic status was also found to be correlated with the severity of malocclusion and general oral health of children in the study conducted by Hanna *et al*. in Beirut city.[17] Thus, offering good public dental services and properly planning public awareness and educational programs that reach all society levels needs strategic management.

Conclusion and Recommendations

Knowledge and awareness toward the importance of regular dental checkup for children; the deleterious effect of lost primary teeth; and the uses, care, and follow-up of space maintainers is very low among adults in Saudi Arabia. The parents' educational background and socioeconomic status showed a significant impact on their knowledge and awareness level. Such findings highlight the importance of directing oral health policy to design dental services and prevention programs as well as educational programs for both adults and children at a cost-effective level. Training the general dental practitioners to handle interceptive problems might be another goal to consider and develop.

Based on this baseline original study results, the future scope of this study will be to conduct further investigations with actions research design to explore the effectiveness of multiple oral health policy strategies related to space management problems in the developing group of population.

Strengths and Limitations

The current study assessed the awareness of adult population in Saudi Arabia toward the care and management of space maintainers. To the best of our knowledge, there are no other reported studies in the literature assessing such matter, especially in Saudi Arabia. However, some drawbacks and limitations in the design and findings of this study can be stated that might limit the generalizability of its results. The survey was conducted using an online platform in an attempt to reach broader demographic areas. However, such approach might have not reached those respondents that can only respond using alternative traditional modes such as papers. Furthermore, most respondents were male, which may also be considered a limitation, as females are more responsible for their children's health care than males in the Saudi culture. Despite findings from this study can be used as a baseline for defining the current status of adults' awareness toward space maintainers in Saudi Arabia. A further indepth assessment regarding such matter is still needed. Focus group interviews with parents, especially

those with children suffering of early lost primary teeth or bad oral hygiene should be conducted. The knowledge and skills of the general dental practitioners in handling cases that require space maintenance and management also need to be carefully assessed for a proper action to be taken.

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