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Knowledge, Awareness and Perception on Space Maintainers among Undergraduate Dental Students - An Online Questionnaire Survey

[1]P. Aishwarya,[2]Dr. JoysonMoses,[3]Dr. SharanyaRavindran

[1]BDS , Junior Resident , Thai Moogambigai Dental college and Hospital , Gangai Amman koil Street, Golden George Nagar, Moggapair, Chennai 600107 , INDIA

[2] MDS, HOD and Professor, Department of Paedodontics and Preventive Dentistry, Thai Moogambigai Dental college and Hospital,Gangai Amman koil Street, Golden George Nagar , Moggapair , chennai 600107 , INDIA

[3] MDS, READER, Department of Paedodontics and Preventive Dentistry, Thai Moogambigai Dental college and Hospital, Gangai Amman koil Street, Golden George Nagar , Moggapair , chennai 600107 , INDIA

ABSTRACT:

Background:Premature loss of primary teeth causes drifting of the adjacent teeth into the lost space and obstructing the eruption of permanent toothresults in several dental discrepancies that demands early intervention and preventive measures. One of the most common preventive strategyis the use of space maintainer appliances though safe yet requires appropriate knowledge and practical expertise to produce effective treatment outcome.

Aim:The present study was aimed to determine the knowledge awareness among the undergraduate dental students on space maintainers and also to assess their perception towards its clinical application.

Methodology:An online questionnaire survey was carried out among 201 undergraduate dental students across Tamilnadu using Google forms distributed through various social media platforms. The data was statistical analyzed using SPSS (Statistical Package for the Social Sciences) Version 22.0 software.

Result: The online questionnaire survey showed 81.09% familiarity towards space maintainers with least being III years (60%) nonetheless only 48% III years followed by 65.75% interns and 75.47% final years answered appropriately on various indications of space maintainers (61.69%) while 45.77% were not aware oftheircontraindications in clinical practice. 71.64% agree and 60.7% believe application of space maintainers during mixed dentition aid in preservation of occlusion, integrity of dental arches and reduce the severity of malocclusion.

Conclusion:The present study illustrates that the majority of the undergraduate dental students possess familiarity and slightly higher level of perception however evidently lack theoretical knowledge, expertise and self-confidence that necessitates organizing hands-on courses, dental education programs and workshops for effective implementation of preventive and interceptive strategies in their routine practice.

Keywords:Eruption, Fixed appliance, Perception, Permanent dentition, Space maintainers, Tooth loss.

Introduction:

Premature loss of primary teeth results in drifting of the adjacent teeth into the lost space and obstructing the permanent tooth to erupt in its normal physiological and functional position subsequently causing dental discrepancies in the permanent dentition configuration that includesloss of arch length, decreased arch space, drifting or tipping of teeth, crowding, supra-eruption of the opposing tooth, midline shift, impaction, ectopic eruption and dental caries [1, 2, 3].Failure to maintain space as a result on early loss of primary tooth can occur in conditions like extensive caries, traumatic injury, abnormal root resorption, systemic diseases, and hereditary syndromes [4, 5].Early detection of these discrepancies and appropriate management by incorporating preventive interventions will minimize the severity of the malocclusion, time and cost of the treatment and reduces the complexes during further management.One of the most common preventive measure recommended to allow the permanent tooth to erupt unhindered into the proper alignment and occlusion after loss of primary tooth are the “Space maintainer appliances” [6, 7].

Space maintainers are fixed or removable appliances placed to preserve space created by tooth loss, preserve integrity of dental arch, to establish normal occlusion without compromising esthetics, phonetics and deglutition and to prevent abnormal habits that includes thumb sucking, tongue

thrusting and related oral complications [8, 9]. Many appliance types and designs were developed over the years to accommodate clinical circumstances [10- 13]. Ideally, a space maintainer should maintain desired proximal dimensions, functionally active or passive, should not interfere with eruption, not restrict normal growth and function, simple to construct, strong enough to withstand force of mastication, and easily cleansable.

The choice of space maintainer depends on various factors such as time elapsed since tooth loss, dental age of the patient, eruption sequence, amount of bone coverage, congenital absent/delayed eruption and clinical condition that needs accurate assessment and knowledge awareness to establish the best treatment plan in order to maintain arch length, achieve proper occlusal relationship with stable aesthetics and function for the child through the long-term course of space maintainer appliance use. Studies have shown poor parental knowledge towards utilization of preventive and interceptive orthodontic appliances that needs immediate attention and appropriate guidance, and counselling by the dental professionals. Studies have also shown that proper patient education, parental education, follow-up, awareness of oral health, and improved care of primary and mixed dentition are significantly associated with dental professionals and student's knowledge perceptions [1,5, 6, 8, 9, 16].

Hence the present study was aimed to determine the knowledge awareness among the undergraduate dental students on space maintainers and also to assess their perception towards its clinical application.

Materials and Methods:

A online based questionnaire was carried out among 201 undergraduate dental students across Chennai, Tamilnadu to assess the knowledge awareness on space maintainers and to determine their perception towards its application based on their clinical experience. After obtaining the Ethical clearance, the prerequisite information was collected using previous studies and available evidence-based literature. Ten relevant online questionnaire with few selected responses to specific questions along with a few close-ended questions (Yes/ No/ Maybe) was prepared and evaluated using Google forms generated and distributed through various social media platforms among the study participants.

Statistical Assessment:

Non-probability, random sampling method was preferred that yielded responses from 201undergraduate dental students. Response data recorded were evaluated using SPSS (Statistical Package for the Social Sciences V22.0 Illinois, Chicago) software Version 22.0. The internal consistency of the questionnaire was adequate (Cronbach's alpha = 0.759). All the study respondents were instructed about the purpose of the study and pre-filled online consent was obtained for their voluntary participation.

Results:

On analysis of the given data the mean age of the study population was observed as 22.20 ± 1.34 years (mean ± S.D) with 0.186 at 95% confidence level comprising of 37.31% III years, 26.37% IV year (Final year) undergraduate dental students, and 36.32 % were CRRI dental students respectively. Majority of the study participants (81.09%) were familiar with the term "space maintainers" among which 60% III Years, 76.71% interns and 79.25% final years had knowledge on classification system of space maintainers.

On assessment of awareness and perception towards clinical aspects of space maintainers about 2/3rd of the dental students (71.64%) agree with the use of space maintainers during mixed dentition phase however only 58.9% interns and 46.67% III years were aware that space maintainers can aid in preservation of occlusion (9.95%), integrity of dental arches (13.93%)and primate spaces (16.42%).Only 48% III years followed by 65.75% interns and 75.47% final years answered properly on various indications of space maintainers (61.69%) while 45.77% were not sure on the role of succedaneous tooth either should be present (14.43%) or absent (8.46%) in determining (contraindication) the space maintainer appliance in clinical practice.

Among various factors governing the selection of space maintainers 60.7% believe appliance integrity, maintenance and modifiability, patient cooperation together plays a significant role among which 48.76% indicated space maintainer appliance can either be active or passive (not an ideal requirement) while 40% of III years were more concerned about appliance integrity along with adverse effects that includes plaque accumulation, pain and caries (81.09%)**(Table 1).**

Table 1: Table showing the Questionnaire Responses:

1	Q1	3rd Year	N %	4th year	N%	CRRI	N%	TOTAL	N %	p-value
1. Do you know what is a space maintainer?	a. Yes	62	82.67	40	75.47	61	83.56	163	**81.09**	**0.2351**
	b.No	5	6.67	9	16.98	3	4.11	17	8.46	
	c.Maybe	3	4.00	2	3.77	5	6.85	10	4.98	
	d.I have never heard	5	6.67	2	3.77	4	5.48	11	5.47	
	Total	75	100.00	53	100.00	73	100.00	201	100.00	
2	Q2	3rd Year	N %	4th year	N%	CRRI	N%	TOTAL	N %	p-value
2. Do you know the classification of space maintainer?	a.Fixed	13	17.33	6	11.32	8	10.96	27	13.43	**0.2341**
	b.Semi fixed	5	6.67	2	3.77	2	2.74	9	4.48	
	c.Removable	12	16.00	3	5.66	7	9.59	22	10.95	
	d.All of the above	45	**60.00**	42	**79.25**	56	**76.71**	143	71.14	
	Total	75	100.00	53	100.00	73	100.00	201	100.00	
3	Q3	3rd Year	N %	4th year	N%	CRRI	N%	TOTAL	N %	p-value
3. Space maintainer is mostly used in	a. Primary dentition	15	20.00	6	11.32	10	13.70	31	15.42	**0.3498**
	b. Permanent dentition	8	10.67	3	5.66	9	12.33	20	9.95	
	c. Mixed dentition	48	64.00	43	81.13	53	72.60	144	**71.64**	
	d. None of the above	4	5.33	1	1.89	1	1.37	6	2.99	
	Total	75	100.00	53	100.00	73	100.00	201	100.00	
4	Q4	3rd Year	N %	4th year	N%	CRRI	N%	TOTAL	N %	p-value
4. What is the objective of space maintainer?	a. Preservation of primate space	16	21.33	5	9.43	12	16.44	33	**16.42**	**0.01976***
	b.Preservation of the integrity of the dental arches.	14	18.67	5	9.43	9	12.33	28	**13.93**	
	c. Preservation of normal occlusal planes	10	13.33	1	1.89	9	12.33	20	**9.95**	
	d. All of the above	35	**46.67**	42	**79.25**	43	**58.90**	120	59.70	
	Total	75	100.00	53	100.00	73	100.00	201	100.00	
5	Q5	3rd Year	N %	4th year	N%	CRRI	N%	TOTAL	N %	p-value
5.Indications of space maintainer	a. If the space after premature loss of deciduous teeth shows signs of closing	29	38.67	8	15.09	14	19.18	51	25.37	**0.03101***
	b. To avoid supreruption of a tooth from a opposing arch	7	9.33	4	7.55	9	12.33	20	9.95	
	c. Both a & b	36	**48.00**	40	**75.47**	48	**65.75**	124	61.69	
	d. None of the above	3	4.00	1	1.89	2	2.74	6	2.99	
	Total	75	100.00	53	100.00	73	100.00	201	100.00	

6	Q6	3rd Year	N %	4th year	N%	CRRI	N%	TOTAL	N %	p-value
6. Contradictions of space maintainer?	a. If the space shows no signs of closing	34	45.33	10	18.87	19	26.03	63	31.34	**0.01921***
	b. When succedaneous tooth is absent	6	8.00	3	5.66	8	10.96	17	**8.46**	
	c.Whensuccedaneous tooth is present	9	12.00	7	13.21	13	17.81	29	**14.43**	
	d. Both a &b	26	34.67	33	62.26	33	45.21	92	45.77	
	Total	75	100.00	53	100.00	73	100.00	201	100.00	
7	Q7	3rd Year	N %	4th year	N%	CRRI	N%	TOTAL	N %	p-value
7. What are the factors governing the selection of space maintainer appliance?	a.Appliance integrity	30	40.00	9	16.98	13	17.81	52	25.87	**0.00686***
	b. Maintenance & modifiability	5	6.67	2	3.77	8	10.96	15	7.46	
	C. Patient co-operation	5	6.67	5	9.43	2	2.74	12	5.97	
	d. All of the above	35	46.67	37	69.81	50	68.49	122	60.70	
	Total	75	100.00	53	100.00	73	100.00	201	100.00	
8	Q8	3rd Year	N %	4th year	N%	CRRI	N%	TOTAL	N %	p-value
8. A space maintainer may not be required if there is	a. Existence of cuspal interference	19	25.33	7	13.21	13	17.81	39	19.40	**0.57051**
	b. Widely spaced primary dentition	6	8.00	2	3.77	6	8.22	14	6.97	
	C. a & b	47	62.67	42	79.25	51	69.86	140	69.65	
	d. None of the above	3	4.00	2	3.77	3	4.11	8	3.98	
	Total	75	100.00	53	100.00	73	100.00	201	100.00	
9	Q9	3rd Year	N %	4th year	N%	CRRI	N%	TOTAL	N %	p-value
9. What is not a ideal requirements of a space maintainer?	a. Simple	26	34.67	7	13.21	16	21.92	49	24.38	**0.1024**
	b. Durable	7	9.33	6	11.32	11	15.07	24	11.94	
	C. Active	32	42.67	33	62.26	33	45.21	98	48.76	
	d. Easily cleanable	10	13.33	7	13.21	13	17.81	30	14.93	
	Total	75	100.00	53	100.00	73	100.00	201	100.00	
10	Q10	3rd Year	N %	4th year	N%	CRRI	N%	TOTAL	N %	p-value
10. What are the adverse effects of space maintainer?	a. Plaque accumulation	14	18.67	3	5.66	13	17.81	30	14.93	**0.4019**
	b. Caries	1	1.33	2	3.77	1	1.37	4	1.99	
	c. Pain	1	1.33	1	1.89	2	2.74	4	1.99	
	d. All of the above	59	78.67	47	88.68	57	78.08	163	81.09	
	Total	75	100.00	53	100.00	73	100.00	201	100.00	

***p<.05- Significant**

Discussion:

The present questionnaire-based study carried out among the undergraduate dental students to determine the knowledge awareness and also to assess the perception towards clinical application of space maintainers revealed81.09% familiarity towards space maintainer among which majority were final years followed by Interns. MuralidharanVA [1] in a similar study showed a better response among third years compared to other groups however Soni HK [2], Ahuja N et al [5] and Al -Dlaigan YH et al [6] revealed higher familiarity towards preventive dental care on the use of space maintainers among post graduate dental students. The difference in these observation can be attributed to the fact that theoretical knowledge, preclinical exercise and training towards the importance of space maintainers are higher among post graduate students and Interns thus signifying the need formandatory comprehensive teaching, preclinical demonstration and encouraging the undergraduate dental students towards management of space in the mixed dentition patients with premature loss of primary teeth.

In the present study only half of the dental students (48.76%) responded correctly on ideal requirements of space maintainer appliance among which 48% III years followed by 65.75% interns and 75.47% final years answered on various indications of space maintainers (61.69%). This was in accordance with most of the previous studies by VK Muralidharan [1], Nagarajappa et al [7], Ali A et al [8] and Alduraihim HS et al [9] focused on application, treatment outcomes and durability that revealed clear lack of theoretical knowledge among dental students, parents and general population towards various available treatment modalities. Green J [10] and Ari T [11] in their observations revealed that proper patient education, parental knowledge awareness, public awareness about the maintenance and care of the primary and mixed dentition, especially with fixed appliance space maintainers along with regular follow ups are major responsibilities of dental professional rather than pediatric dentist alone. Thus emphasizing the importance of instructing and educating about maintaining the arch integrity by undergraduate dental students at institutional level and dental professionals during first visit and at the course of treatment.

Studies by Ahuja N [5], Alduraihim HS et al [9] and Linjawi AL et al [12] have shown fixed space maintainers are commonly preferred than removable ones similar to the present study demonstrating satisfactory information about the use of fixed space maintainers in uncooperative patients where oral health hygiene becomes questionable. Nearly one third of the respondents (40%) were more concerned about appliance integrity along with adverse effects that includes plaque accumulation, pain and caries (81.09%) in contrast to studies by VK Muralidharan [1], Ali A et al [8], Khalfi L et al [13], and Almeedani LA [14]et al studies that supported difficulty in placement and iatrogenic infection as a probable factor towards its reduced use.

Muralidharan VA [1], Kallar S [4], Ali A et al [8], Alduraihim H et al [9], Talekar et al [15] and Rani TS et al [16] observed lack of perception, high cost and parent's refusal were key factors governing the use of space maintainer. Similarly, majority of the dental students in our study also agree appliance integrity, patient cooperation, maintenance cost and parental refusal plays a crucial role. Conversely, a slightly higher level of perception among undergraduate dental students towards clinical application was reported in this study indicating adequate awareness and belief among undergraduates that the use of space maintainers can aid in preservation of occlusion (9.95%), integrity of dental arches (13.93%)and primate spaces (16.42%).Cantekin K et al [17], Shamsaddin et al [18], Moore TR et al [19] and Fathian et al [20] revealed difference in the clinical failure rate of fixed and removable appliances can be attributed to the debondingand the child's cooperation in relation to the use of the appliance. It is evident that these fixed appliance do not interfere with jaw growth, tooth development and eruption, and mastication. Studies have also shown fixed appliance permit sufficient space, does not necessitate teeth preparation and allow adequate space for the developing permanent teeth to erupt naturally into the oral cavity.

Nearly half of the respondents (45.77%) were not sure on the role of succedaneous tooth either should be present (14.43%) or absent (8.46%) in determining (contraindication) the space maintainer appliance in clinical practice demonstrating lack of expertise towards use of space maintainer. A similar study by VK Muralidharan [1], Talekar et al [15], Rani TS et al [16] and Bhat N et al [21] reported the importance of timely space maintenance, presence or absence of succedaneousteeth, care of deciduous teeth, deleterious effects of oral habits to be included in order to prevent the probable mesial or distal drift of adjacent teeth. Borrie et al [22] significantly revealed that the greatest barrier in providing preventive and interceptive orthodontic care was the practitioners' especially dental student's lack of self-confidence in their chosen treatment and management plan.The relatively low level of self-confidence is attributed to the lack of educational programs, undergraduate dental curriculum and training workshops on space maintainers and its clinical implication.

Conclusion:

Within the limitations of the study, though the majority of the undergraduate dental students possess familiarity and slightly higher level of perception towards the use of space maintainer during mixed dentition however evidently lack theoretical knowledge, expertise and self-confidence towards its clinical application. Thus, signifies the need for incorporating clinical, and theoretical knowledge among third years followed by other groups and encourage use of space maintainers to gain practical skill by organizing hands-on courses, workshop and facilitate implementation of preventive and interceptive strategies in their routine clinical practice.

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