Shortened Dental Arch Concept: an Investigation of Dentists' awareness, Attitudes, and Mode of Its Restoration in Western region of Saudi Arabia.

ABSTRACT

Objective: The occlusion of complete dental arch is commonly desired but not vital nor always attainable. This study investigated dentists' knowledge and attitude of the shortened dental arch (SDA) concept in Saudi Arabia.

Methods: Over the period of nine months, a cross-sectional study with self-designed-structured questionnaires was conducted, 200 questionnaires distributed.

Results: Sample of 154 dentists, of whom only 34.4% of the respondents were aware of the SDA concept. However, 81% always replace missing molars. Moreover, 69% did not apply the concept in their treatment plan and not use it as treatment option. 54% restored with cobalt chrome removable partial dentures. Unexpectedly 52.6% think that they will lose income if they apply the concept. Surprisingly, 63% of the sample just came across the SDA concept when we introduced it. There is a significant relationship between higher level of education and the selection of SDA concept as an option for treatment. Governmental institutions are more aware of the selection of the Concept compared to Private, p-value = 0.044.

Conclusions: Most dentists agreed that the SDA is applied and beneficial treatment option for old patients. Though, application of the SDA diverse noticeably between dentists. The attitude and awareness of dentists in Jeddah as it relates to shortened dental arch concept is not remarkable.

Keywords: Dentist awareness, oral function, attitude, shortened dental arch.

Introduction

The demographic of senior adults (i.e., 65 years of age and older) who retained their natural teeth is rising and will be gradually large part of dental practice in the near future [1]. Therefore, to offer care for the partially dentate or edentulous patient, dentist should consider a number of aspects, such as oral functionality, vertical dimension, occlusion, maintenance of hard tissue, and temporo-mandibular joint (TMJ) health, as well as patient comfort. The functional demands of patients are highly variable and individual, requiring dental treatment to be tailored to the individual's needs and adaptive capability. The World Health Organization (WHO) indicates that a functional, esthetic, natural dentition has at least 20 teeth, while the literature indicates that dental arches comprising the anterior and premolar regions meet the requirements of a functional dentition. A common partial edentulsim scenario is the shortened dental arch (SDA). This is a reduced dentition with missing posterior teeth and intact anterior teeth.[2] Such dental situation may develop in a considerable number of subjects because molar teeth are "high‑risk teeth" and tend to be lost at an earlier stage than anterior and premolar teeth[3-5]. Kayser [2] estimated that the proportion of subjects with SDAs may reach 25% of the population in the age group 41–45 and it could become 70% in the age group 61–65.

SDA has been described as a minimum of four occlusal units which provide functional satisfaction to older adults with sufficient adaptive capacity [2]. It is a problem based treatment approach that meets the functional, biological, social and psychological needs of the older adult to an acceptable level and potentially reduces costs of treatment. [6–9] Evidence indicates older individuals with a reduced dentition of four intact premolars and one occluding pair of molars have adequate masticatory function and are able to maintain satisfactory levels of occlusal stability.[10, 11]

The decision to replace missing posterior teeth may depend on various factors including patient's perception of need for the prosthesis and/or diagnosis by the clinician for maintenance of oral health. The traditional approach of replacing posterior missing teeth has been with partial removable dental prostheses (PRDPs). Although patients with perceived impaired function have reported benefits from PRDPs, [12] optimal oral hygiene is required to maintain the remaining dentition. [13]

The WHO defines the SDA concept by those patients who are being able to function on 20 occluding units (incisors, canines and premolars in maxilla and mandible) [14].

For many years, it was thought that any missing tooth should be replaced [15], although numerous clinicians and researchers questioned this opinion. Käyser was the first to coin the term "shortened dental arch" (SDA) to describe the concept of acceptable oral function with partial dentition [16]. Through a number of clinical studies, he and his co-workers concluded that many people could function without a full complement of teeth and that not all missing teeth require replacement [17–21].

There are also different types of prosthetic appliances to treat them but there are many factors that guide their selection. Most of patients prefer maintaining remaining teeth with functionally sound occlusion and healthy peridontium rather than extensive restorative procedures. There are many criteria before considering SDA as a treatment option, anterior and premolar teeth should be sound and in good occlusion and absence of any parafunctional habits or mandibular dysfunction. Some clinical studies shows that applying SDAs concept will provide sufficient chewing, aesthetic and TMJ stability. However, some patients refuse to leave their missing teeth without restoration. The aim of this research is to evaluate knowledge, attitude of general practitioner dentists and prosthodontists among Jeddah, Saudi Arabia, regarding SDA concept, and what are the treatment modalities they used.

Material and Methods

The Research Ethics committee at King Abdulaziz Dental Hospital approved this study. A special data collection form was developed and validated through a pilot study. The pilot study comprised five dentists and its aim was to evaluate the clarity and the feasibility of the questions.

The study conducted over the period of nine months starting from September 2015. During that phase questionnaires were distributed among 200 general dentists, restorative consultants and prosthodontists from 47 governmental hospitals and private dental clinics. General information about the SDA concept was included in the questionnaire. The questionnaire was divided into 4 main sections: Questions about gender, age, working sectors type, education level and specialty. Then Questions regarding knowledge, use of SDA concept, its application and the common treatment options selected by the participant to treat such cases. Third section was about the attitudes related to various statements concerning SDA concept and finally, dentist's own opinion and vision regarding the concept, the benefits and drawbacks associated with it.

The awareness and knowledge about the SDA concept, and the modality of treatment were the main target of the survey. These clinics were selected randomly according to the region of the city, and each of them were visited at least 2 times. Dentist who did not know about the SDA concept had received explanation at the time of the first visit.

Statistical Methodology

This study was analyzed using IBM SPSS version 22. A simple descriptive statistics was used to define the characteristics of the study variables through a form of counts and percentages for the categorical and nominal variables while continuous variables are presented by mean and standard deviations. To establish a relationship between categorical variables, this study used chi-square test. While comparing two group means and more than two groups, an independent *t*-test and One-way ANOVA was used, with Least Significant Difference (LSD) as a post hoc test, respectively was used. These tests were done with the assumption of normal distribution. Otherwise, Welch's *t*-test for two group means and Games Howell for multiple groups were used as an alternative for the LSD test. Lastly, a conventional p-value <0.05 was the criteria to reject the null hypothesis.

Results

One hundred and fifty four questionnaires were completed out of two hundreds hand distributed questionnaires (response rate 72.1%). 90 of them (58.4%) were male and 64 (41.6%) were female. 43 (27.9%) of the dentists were Saudi, and 111 (72.1%) were Non-Saudi.

Dentists who are practicing on governmental hospitals and clinics were 64 (41.6%) while those who works on private practice were 90 (58.4%) all study sample characteristics are listed in Table 1.

Table 1: Characteristics of Study Samples

Demographics		Count	%
Total		154	100.0
Gender	Male	90	58.4
	Female	64	41.6
Nationality	Saudi	43	27.9
	Non-Saudi	111	72.1
Dental Practice	Governmental	64	41.6
	Private	90	58.4
Location of Practice	North	45	29.2
	South	66	42.9
	West	33	21.4
	East	10	6.5
Type of dentists	General Dentist	81	52.6
	Restorative	23	14.9
	Prosthodontics Dentist	50	32.5
Educational Level	BDS	75	48.7
	Post Grad or Master	40	26.0
	PhD	39	25.3

Regarding the practice of SDA concept, (34.4%) had heard about the concept, while (62.3%) of them never heard about it, and only 3.2% of dentists answered with "I don't know" as shown in Figure 1.

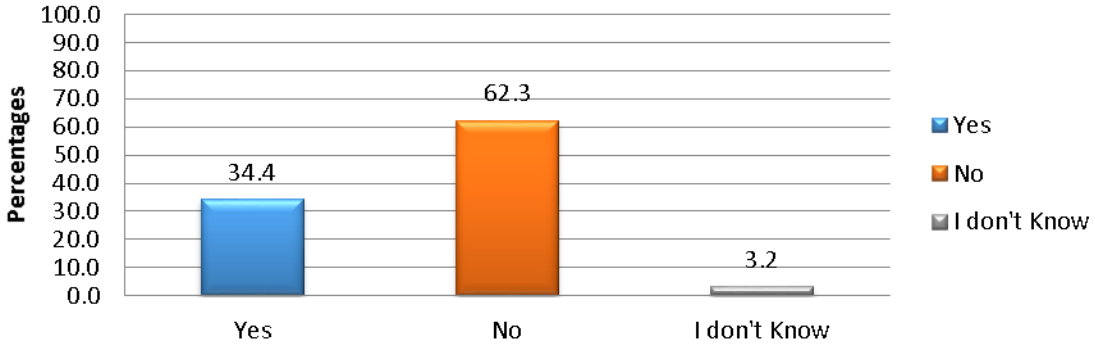


Figure1: Knowledge of Shorten Dental Arch Concept.

47.2% of the dentists treated less than five cases of SDA, and 15.1% had treated from 5 to 9 cases, 11.3% had treated from 10-15 cases, while only 5.7% had used the concept to treat more than 15 cases as shown in Figure 2.

The dentists who always replace molars were 125 (81.2%), in which 47 (37.6%) of them replaces molars to improve masticatory ability, 16 (12.8%) replaces molars for aesthetic purposes, 57 (45.6%) replaces molars for both reasons (mastication and aesthetic), and only 5 (4%) replaces molars only because of patient's desire Table2.

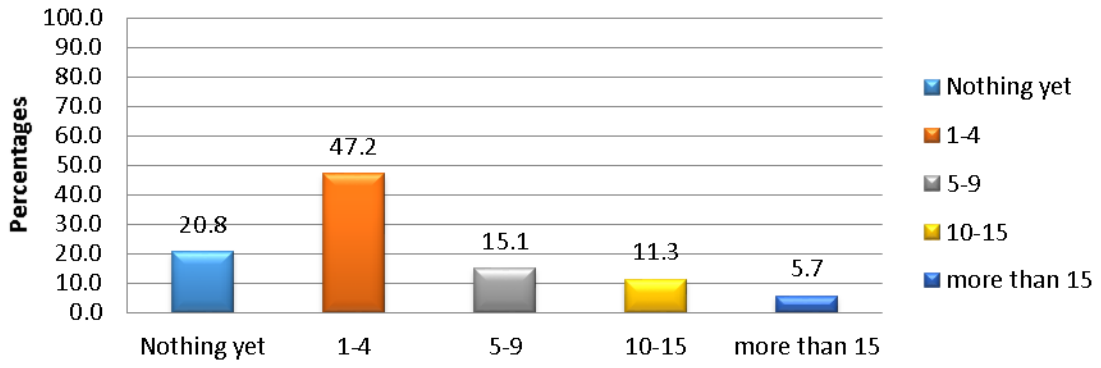


Figure 2: Number of cases treated by SDA Concept.

Table 2: Frequency and reasons of replacing missing Molrs.

Variables		Count	%
Total		154	100.0
Did you always replace missing molars?	Yes	125	81.2
	No	29	18.8
		Count	%
Total		125	100.0
If you answered the above question by 'Yes', Why you replaced them?	To Improve Masticatory Ability	47	37.6
	To Improve Esthetic	16	12.8
	Both	57	45.6
	To satisfy patient's demand	5	4.0

Regarding the application of SDA concept, 106 dentists do not apply the concept, even if they know about it, while 48 used it (18.8% rarely, 11.7% regularly, 0.6% "one dentist" always) as shown in Figure 3.

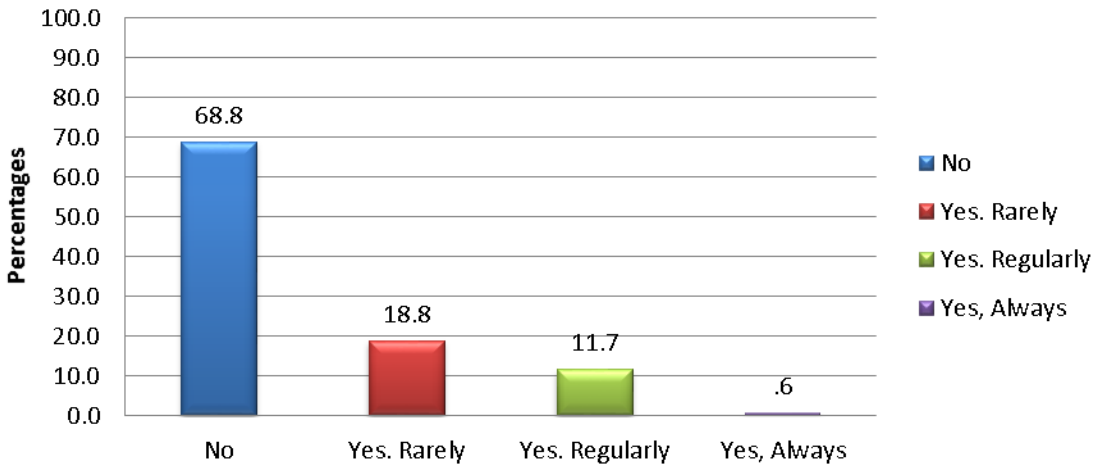


Figure 3: Application of SDA Concept.

The most selected mode of treatment for SDA by the participants was metallic removable partial denture (RPD) 54%, then acrylic RPD 22.1% as shown in Figure 4.

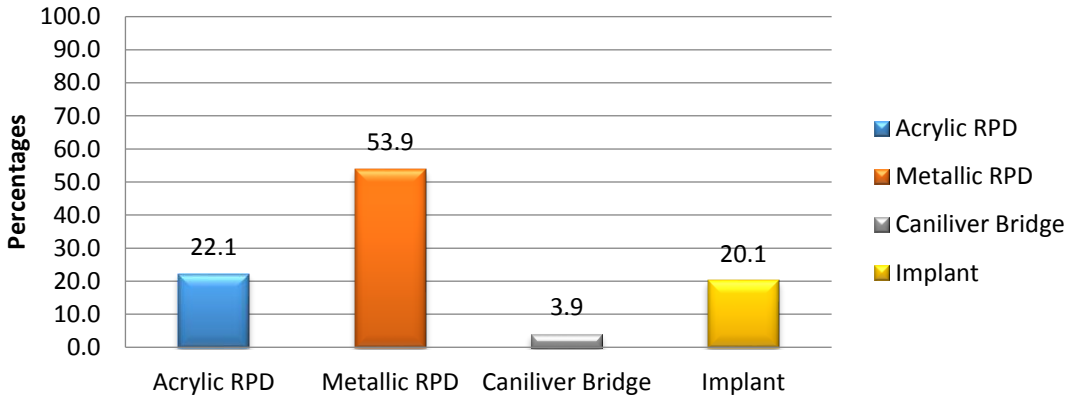
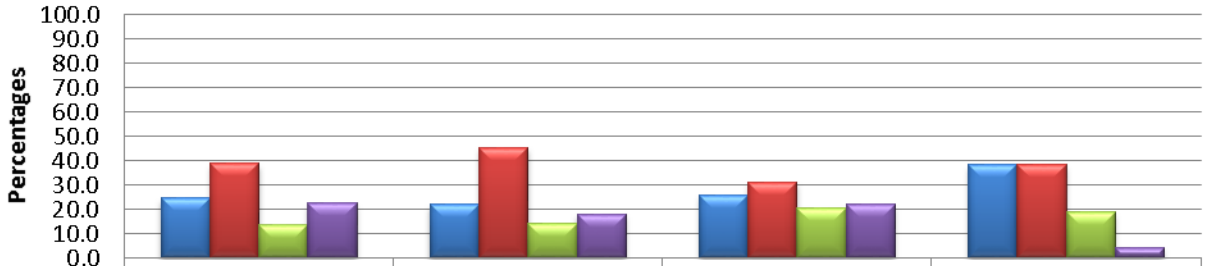


Figure 4: The selected mode of treatment for SDA.

The dentists have been asked about their opinion regarding the effect of SDA concept on the chewing function (24.7% satisfactory, 39% Acceptable, 13.6% don't know, and 22.7% unsatisfactory). Regarding dental appearance (22.1% satisfactory, 45.5% acceptable, 14.3% don't know, and 18.2% unsatisfactory). For oral comfort (26%

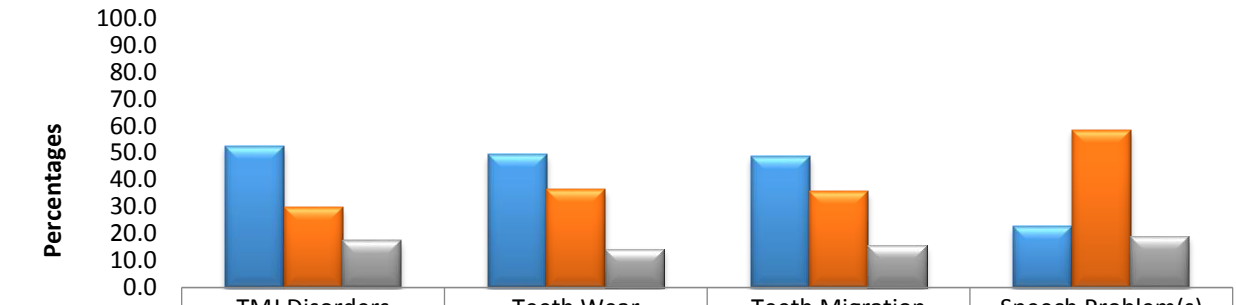
satisfactory, 31.2% acceptable, 20.8% don't know, and 22.1% unsatisfactory), and speech comfort (38.3% satisfactory, 38.3% acceptable, 18.8% don't know, and 4.5% unsatisfactory) Figure 5.



	Chewing Function	Dental Appearance	Oral Comfort	Speech comfort
Satisfactory	24.7	22.1	26.0	38.3
Acceptable	39.0	45.5	31.2	38.3
Don't Know	13.6	14.3	20.8	18.8
Unsatisfactory	22.7	18.2	22.1	4.5

Figure 5: Dentists' opinion regarding chewing, appearance, oral comfort and speech with SDA concept.

They were similarly asked if SDA contribute to TMJ disorders (52.6% Agree, 29.9% Disagree, and 17.5% don't know), teeth wear (49.4% Agree, 36.4% Disagree, and 14.3% don't know), teeth migration (48.7% Agree, 35.7% Disagree, and 15.6% don't Know), and speech problems (22.7% Agree, 58.4% Disagree, and 18.8% don't know) Figure 6.



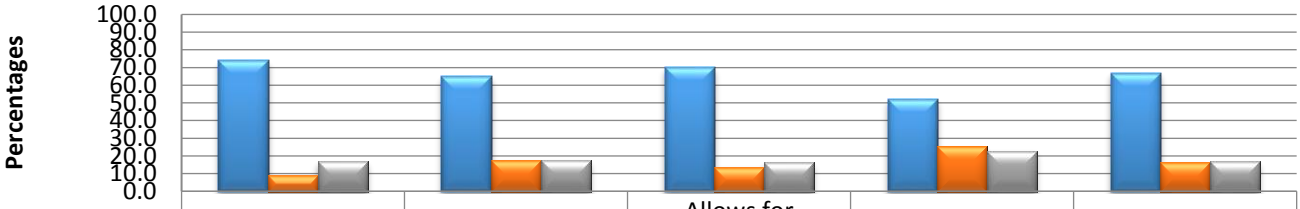
	TMJ Disorders	Teeth Wear	Teeth Migration	Speech Problem(s)
Agree	52.6	49.4	48.7	22.7
Disagree	29.9	36.4	35.7	58.4
I Don't Know	17.5	14.3	15.6	18.8

Figure 6: Dentists' opinion regarding contribution of SDA to oral disorders and problems.

Unexpectedly, 52.6% think that they will lose profits if they apply the SDA concept while 47.4 % think that it will not affect the clinic income.

Moreover, 74% believes that the concept will simplify the oral hygiene of the patient, while 9.1% disagreed, and16.9 % don't know. 64.9% think that the concept will allow better patient economy, while 17.5% disagree. Regarding their thoughts about treatment plan simplicity, 70.1% think it will be simpler, 13.6% disagree, while 16.2% don't know.

Dentists similarly were asked about their thought about remaining teeth survival with SDA concept, 51.9% think that remaining teeth will last longer, 25.3% disagree, and 22.7 don't know. Regarding their thoughts of the risk of over-treatment, 66.9% believes that the concept will reduce the over-treatment, 16.2% disagree, 16.9 do not know.



	Simplifies oral hygiene for patient	Allows for better patient economy	Allows for simpler treatment planning	Allows patient to keep his own teeth longer	Reduce the risk of over-treatment
Agree	74.0	64.9	70.1	51.9	66.9
Disagree	9.1	17.5	13.6	25.3	16.2
I don't know	16.9	17.5	16.2	22.7	16.9

Figure 7: Dentists' opinion about the advantages of SDA Concept.

The dentists were asked about the time since they came across the SDA concept; 97 (63%) of them said "now only" which means by the explanation of the authors at the time of the first visit. While 17 (11%) knew about the concept since 2 years ago, 15 (9.7%) since 4 years ago, 6 (3.9) since 6 years ago, 9 (5.8%) since 8 years ago, and 10 (6.5%) had come across the concept since 10 years ago or more.

For those who used to apply the SDA concept; they were asked regarding the usual patient's reaction after they suggested the SDA treatment, 28 (18.2%) said that the patient refuses, 69 (44.8%) said that the patient agreed immediately, and 57 (37%) said that patient agreed after explanation. When they were asked about their thoughts about the most dental situation that is proposed by SDA concept; 58 (37.7%) think that the most situation is that with caries confined to molar region. 22 (14.3%) in situation of a good prognosis of anteriors and premolars. 28 (18.2%) thinks it's most proposed to old patients, only 9 (5.6%) said it's proposed to a limited restorative case, 11 (7.1%) thought it's mainly targeted to medically compromised patients, and 26 (16.9%) believes that it's proposed to financially limited patients.

There is a significant relationship between the selection of Shortened dental arch concept for treatment & the level of education. With a higher level of education, the selection of shortened Dental arch concept for treatment also is higher, p-value = 0.004.

Governmental institutions are more aware of the selection of the SDA Concept for treatment compared to Private, p-value = 0.044. However, based on this study's sample distribution, it shows that the frequency of usage of SDA concept between these two groups is fairly the same.

Type of dentist play a significant factor in the selection of SDA based on this study's sample size. However if they are using it, prosthodontics are more using it often, followed by the restorative doctors and lastly by the general practitioners, p-value = 0.006.

Discussion

The literature indicates that dental arches comprising the anterior and premolar regions meet the requirements of a functional dentition. Potential physical, sensory, and cognitive impairments associated with aging may make oral health self-care and patient education/communications challenging [23, 24]. Additionally, among a group of eleven types of barriers, financial barriers were mentioned most often as a barrier to receive the needed dental care [25].

The SDA approach offers an alternative of less treatment that is also less problematical, less time consuming and less expensive (26). It would therefore fit well in a worldwide perspective with widespread lack of dental and economic resources as indicated by the WHO (27).

There are indications that the SDA concept may hold value in treatment plans for patients in the old age group [28]. There is no indication the reduced dental arch can cause

overload on the temporomandibular joint or teeth, suggesting the neuromuscular system acts competently controlling the supreme mastication forces according to occlusal conditions [29]. About 62.3 % of respondents were not aware of the SDA concept. This can be considered as a high even though the SDA has been described as a feasible treatment choice in the dental literature.

PhD holders were more aware of the SDA concept than those who hold Master or bachelor degrees in dental sciences (significant difference, $p = 0.004$). This difference may be due to exposure of those dentists to different dental schools in the UK and USA during their postgraduate studies which incorporating the SDA concept into their curricula. The majority of those who were aware of SDA agreed that it is a beneficial treatment choice for the old dental patients. A large proportion of dentists uninformed of the SDA concept were also in agreement with this treatment selection.

However, 69%of the dentists do not apply the concept, even if they know about it, while 48 used it (18.8% rarely, 11.7% regularly, 0.6% "one dentist" always). A similar rate of application of the SDA by dentally qualified staff in restorative dentistry in Netherlands was reported by Witter et al.[31]

Responding dentists showed a positive approach to SDA concept for treatment with regarding oral function, esthetics, speech, oral hygiene and oral comfort Figure 5 & 7.

Comparable studies [30-32] on attitudes and perception of SDA therapy among dentists have shown comparable outcomes to the present study.

Also noteworthy was the comparable assessment (satisfactory or acceptable) by dentists in this study, with regard to the chewing function 64%, appearance 68%, and oral comfort 57%, to a survey conducted in Tanzania [33]. Most of the responding dentists in Tanzania thought that SDA provided satisfactory or acceptable chewing function 71%,

dental appearance 79%, and oral comfort 48%. This shows that there was a remarkable inconsistency between the academic and clinical/practical reception of the SDA concept.

A large proportion of dentists (74%) in this study agreed with the SDA as a practical treatment choice, which is similar to previous studies conducted in other countries, e.g. the UK 77%,[30].

According to the assessment of dentists in the current study, patients normally reacted well to the application of the SDA as a substitute treatment when benefits were clarified.

The percentage of patients refuses the treatment with SDA concept in this study was 18% against that of only 7% in a study by Witter et al [31]. It is not that much higher comparing to the advances in the dental treatment and the level of awareness nowadays.

The dentists who always replace molars were 81.2% of the study sample, which is nearly similar to a result of a study done in 2003 in which 89% of the dentists responded confirmed they usually inserted free-end acrylic partial dentures in subjects with SDA. Governmental institutions are more aware of the selection of the SDA Concept for treatment compared to Private, p-value = 0.044. It can be explained as that the treatment in governmental institutions is free and in private they are looking for profit as it has been found in this study surprisingly that 52.6% think that they will lose profits if they apply the SDA concept.

It is recognized that management of older adults with extremely shortened dental arches with less than four occluding units and dissatisfied with function is a challenge. Traditionally, conventional PRDs have been commonly used in this situation and it has continued to be the choice of treatment for most dentists in this study. Hence, the educational presence and emphasis of RPD courses remains significant at dental schools all over Saudi Arabia and trained accordingly.

Conclusion

This conclusion challenges the traditional approach of replacing any missing tooth and instructs the allocation of more dental resources to preventive, diagnostic and restorative services. By offering selected partially dentate patient a treatment option that guarantees oral functionality, easier oral hygiene, comfort, and perhaps reduced costs, the shortened dental arch (SDA) treatment approach appears to provide an advantage without compromising patient care.

The SDA concept is accepted by the majority of dentists but is not widely practiced. It is not very clear nowadays why the concept is not very common among dentists. However, it appears absence of adequate knowledge and understanding of the concept may be responsible for this.

The knowledge of a cross-section on of Saudi dentists about the shortened dental arch therapy appeared not adequate nowadays. It is suggested that the treatment by SDA should be integrated into the undergraduate and postgraduate schools' curricula. To value the idea of preserving the functionally strategic part of dentition and avoid overtreatment with all the associated cost and risk in older age group of dental patients

Within the limitations of the study, it was concluded that general dentists, specialists and prosthodontists had an overall positive opinion toward the SDA concept. There is a need to increase the SDA awareness and acceptance.

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