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

**Running Title: SDA an Investigation of Dentists’ awareness.**

**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< 0.05.

***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 substantial. There is a need to rise the SDA awareness, approval as well as its implantation clinically. Moreover RPDs teaching and practicing should continue to be an integral part of Prosthodontics programs.

**Keywords**: Dentists’ awareness, oral function, attitude, shortened dental arch, RPDs.

**1.Introduction**

Senior dental patients (i.e., 65 years of age and older) who retained their natural teeth is rising and will be gradually large percentage of dental practice in the near future(MMWR Morb Mortal Wkly Rep., 2003). Therefore, to offer care for the partially dentate, dentist should consider a number of aspects, such as oral functionality, vertical dimension, occlusion, care 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) shows 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. Frequent partial edentulsim state is the shortened dental arch (SDA) which is a dentition with missing posterior teeth and integral anterior teeth. (Kayser,1989) Such dental situation may develop in a considerable number of subjects as molar teeth are “high‑risk teeth” and tend to be lost at an earlier stage than anterior and premolar teeth (Halse, Molven, Riordan ,1985. Battistuzzi , Käyser, Peer, 1987.Demirbuga et al, 2014). Kayser 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 (Kayser,1989) .

It is treatment approach that meets the functional, biological, social and psychological needs of the older adult to a satisfactory level and potentially eases costs of treatment. ( Kanno , Carlsson, 2006. Sarita, 2012. Wolfart et al., 2013. McKenna, et al, 2014) Evidence specifies older individuals with a reduced dentition of four integral premolars and one occluding pair of molars have satisfactory masticatory role and are capable to keep acceptable levels of occlusal constancy.( Witter et al, 2001. Sarita et al, 2003)

The choice to replace lost posterior teeth may be contingent on many aspects including patient’s view of need for the prosthesis and/or diagnosis by the clinician for care of oral health. The traditional approach of replacing posterior missing teeth has been with partial removable dental prostheses (PRDPs). Though patients with apparent impaired function have informed benefits from PRDPs, ( Lahti , Suominen-Taipale , Hausen, 2008) ideal oral hygiene is vital to preserve the residual dentition. ( Yeung et al, 2000)

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 ( Hobdell et al, 2003).

For years, it was believed that any missing tooth should be replaced( Marco et al 2011), many clinicians and researchers questioned this opinion. Käyser was the first to use the word “shortened dental arch” (SDA) to define the idea of satisfactory oral function with incomplete dentition

 ( Nassani et al, 2015) . A number of clinical studies it was concluded that several individuals can function without a complete complement of teeth and that not all lost teeth necessitate restoration ([de Sa e Frias,](https://www.ncbi.nlm.nih.gov/pubmed/?term=de%20Sa%20e%20Frias%20V%5BAuthor%5D&cauthor=true&cauthor_uid=15210006) [Toothaker](https://www.ncbi.nlm.nih.gov/pubmed/?term=Toothaker%20R%5BAuthor%5D&cauthor=true&cauthor_uid=15210006), 2004. Ikebe et al, 2011. [Armellini](https://www.ncbi.nlm.nih.gov/pubmed/?term=Armellini%20D%5BAuthor%5D&cauthor=true&cauthor_uid=15583557) , [von Fraunhofer](https://www.ncbi.nlm.nih.gov/pubmed/?term=von%20Fraunhofer%20JA%5BAuthor%5D&cauthor=true&cauthor_uid=15583557), 2004. Thomason et al, 2007. Fueki et al, 2011. Nassani et al, 2010).

 Prospective physical, sensual, and cognitive deficiencies related to aging may challenge oral health self-care and patient training/communications [Yellowitz, Schneiderman, 2014, Razak et al, 2014). Additionally, among a group of eleven types of barriers, financial barriers were mentioned most often as a barrier to receive the needed dental care (Wall et al, 2015).

There are also different types of prosthetic appliances to treat them but there are many factors that guide 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 (De Sa e Frias et al, 2004. Kanno and Carlsson, 2006). However, groups of patients refuse to leave their missing teeth without restoration (Nassani, Kay, 2011). The specific objective of this trial was to acquire dependable outcome data with regard to knowledge, attitude of general practitioner dentists and prosthodontists in Jeddah, Saudi Arabia, about SDA concept. Moreover, to get data about the treatment modalities used by the dentists surveyed. The null hypothesis was there is commendable awareness and knowledge among dentists in western district of Saudi Arabia, and there is no relationship between the selection of Shortened dental arch concept for treatment & the level of education and type of practice.

**2.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 practicality of the questions.

The study conducted over the period of nine months starting from September 2015. During that phase self-structured questionnaires were distributed among 200 general dentists, restorative consultants and prosthodontists from fort seven governmental hospitals and private dental clinics. The sample was a convenience sample. 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 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.

**3.Statistical Methodology**

This study was analyzed using IBM SPSS version 22 (IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp.). 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. Lastly, a conventional p-value <0.05 was the criteria to reject the null hypothesis.

**4.Results**

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

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.

The dentists who always replace molars were 125, from those 47 replaces molars to improve masticatory ability, 16 replaces molars for aesthetic purposes, 57 replaces molars for both reasons (mastication and aesthetic), and only 5 replaces molars only because of patient's desire.

Regarding the application of SDA concept, 106 dentists do not apply the concept, even if they know about it, while 48 used it as shown in Figure 1.



 Figure 1: 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 2.

 Figure2: 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, dental appearance, oral comfort and speech as shown in Figure 3.

Figure 3: Dentists’ opinion regarding chewing, appearance, oral comfort and speech with SDA concept.

They were similarly asked if SDA contribute to TMJ disorders, teeth wear,teeth migration and speech problems as shown in Figure 4

Figure 4: 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 and 16.2% disagree.

The dentists were asked about the time since they came across the SDA concept; 63% of them said "now only" which means by the explanation of the authors at the time of the first visit. While 11% knew about the concept since 2 years ago, 9.7% since 4 years ago, 6 3.9% 6 years ago, 5.8% 8 years ago, and 6.5% had come across the concept 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, 18.2% said that the patient refuses, 44.8% said that the patient agreed immediately, and 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; 37.7% think that the most situation is that with caries confined to molar region. 14.3% in situation of a good prognosis of anteriors and premolars. 18.2% thinks it is most proposed to old patients, only 5.6% said it's proposed to a limited restorative case, 7.1% thought it's mainly targeted to medically compromised patients, and 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 using it more often, followed by the restorative doctors and lastly by the general practitioners, p-value = 0.006.

**5.Discussion**

The SDA tactic provides another option of less treatment that is similarly less problematical, less time consuming and less pricey (Omar, 2004). Consequently fit well in a worldwide perception with common shortage of dental and financial resources as indicated by WHO (WHO; 1992).

The SDA concept is recognized by most dentists but is not commonly implemented clinically. It is not very clear currently why the concept is not very common among dentists. However, it appears that absence of adequate awareness and understanding of the concept may be responsible for this.

There are indications that the SDA concept may hold value in treatment plans for patients in the old age group (BDA ,2013). There is no solid evidence that 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 (Witter et al, 1991. Allen et al 1996). About 62.3 % of dentists contributed in the study were not acquainted of the SDA idea. This is high even though the SDA has been described as a practical treatment choice in the dental literature.

PhD holders were more aware of the SDA concept than dentists who hold Master or bachelor degrees in dental sciences. This difference may be due to exposure of those dentists to different dental schools in the UK and USA during their postgraduate studies which including the SDA concept into their programs. The majority of those who were familiar with SDA agreed that it is a beneficial treatment choice for the old dental patients. A big proportion of dentists uninformed of the SDA idea were similarly in agreement with this treatment selection; a study done in developing country showed the same results (Khan and Omar, 2012).

However, 69%of the dentists do not apply the concept, even if they know about it, this result is comparable to the finding of recent study done in Saudi Arabia (Vohra, *et al*. 2016). Witter reported a comparable percentage of application of the SDA by qualified dentists in restorative dentistry in Netherlands ( Witter et al, 1997).

Responding dentists showed a positive approach to SDA concept for treatment with regarding oral function, esthetics, speech, oral hygiene and oral comfort similar to the findings of recent study in Saudi Arabia[35].

Comparable studies ( Allen et al 1996 . Allen et al, 1998) 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 (Sarita , 2003). Most of the responding dentists in Tanzania thought that SDA provided acceptable chewing function 71%, dental appearance 79%, and oral comfort 48%. This shows that there was a remarkable inconsistency between academic and clinical/practical reception of the SDA concept.

A big percentage of dentists (74%) in this research agreed with the SDA as a applied treatment choice, which is comparable to previous studies done in other countries, e.g. the UK 77% (WHO; 1992).

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

The percentage of patients refuses the treatment with SDA concept in this study was 18% against that of only 7% in only one study asked about this information (Witter et al, 1991). 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 ( Sarita et al, 2003. Yeung et al, 2000).

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 documented that managing old dental patients with a shortened dental arches with less than four occluding components and unhappy with function is difficult. Conventionally, PRDs have been frequently used in this condition and it has continued to be the treatment of choice 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**

The knowledge of a cross-section survey of Saudi dentists in the western district about the shortened dental arch therapy appeared to be not satisfactory. 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. Moreover, teaching and practicing of enough cases for Removable partial prosthodontics should continue to be an integral part of undergraduate and postgraduate programs.

The research hypothesis that there is commendable awareness and knowledge among dentists in western district of Saudi Arabia is not supported by the results, while the null hypothesis that there is no relationship between the selection of Shortened dental arch concept for treatment & the level of education and the type of practice was rejected.

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 rise the SDA awareness, approval as well as its implantation clinically.

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