The effect of using the intraoral scanning from the point of view of dentists and dental lab technicians in Najran region

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Abstract

Background:

The purpose of the present study was to investigate the effect of using the intraoral scanning from the point of view of dentists and dental lab technicians in Najran region, Saudi Arabia.

Materials and methods:

This study is a cross-sectional study, conducted using a questionnaire that were was randomly distributed online to Saudi dentists and dental-lab technicians in Najran region. The questionnaire consisted from three sections of questions: 1) questions about personal information, 2) questions about the features of using the intraoral scan, 3) questions about the extent of relying on intraoral scanning in dental clinics and labs in Najran region. About 178 of dentists and dental lab technicians completed the questionnaire. The statistical analysis program (SPSS v.26) has been used in the study in data entry and analysis, with using the necessary statistical methods to achieve the objectives of the study.

Results:

68.0% of participants were males and 32.0% were females, the majority of participants aged between 30-40 years old, 35.4% of participants had working years

>16 years. The total degree of the efficiency of using the intraoral scan from the point of view of dentists and dental lab technicians was high (M = 4.19 out of 5, RII = 83.9%, SD = 0.86). The prevalence of intraoral scanners in the dental clinics and labs was 86% in Najran region.49.4% knew the effects of different lights on intraoral scanning. 79.8% knew the unit of measure light intensity. 64% knew the indications of intraoral scanning.

Conclusion:

Dentists and dental-lab technicians in Najran region thought that the using of intraoral scanning in dentistry is effective.

Keywords: Dentist, dental-lab technician, Intraoral scanners, light beam, dental arches, restorative dentistry, prepared teeth, implant-supported restorations.

1. Introduction

In the present time, several workflows in dentistry start with an initial impression and a registration of the required teeth, neighboring tissues, and implants. The precision of this step is necessary, because it considered crucial for the success of next steps and final success of the treatment [1].

Intraoral scanners (IOS) devices are used to get optical impressions in dentistry [2]. These powerful devices are able to collect information on the size and shape of the dental arches through projecting a light beam onto the dental arches [2,3]. IOSs are routinely used to obtain digital information in clinical dentistry for many situations such as; diagnosis, restorative dentistry, prepared teeth, and implant-supported restorations [2,4].

Nowadays, IOS influence in the dental office cannot be denied. As IOSs are improving the speed and quality of dental work [5, 6]. IOS have many advantages when compared to the conventional methods of recording the intraoral structures such as; the comfort for the patient, working speed, elimination of cross infections, intraoperative evaluation of preparations, and the possibility of indefinite storage of digital models [5, 6]. Scanners can be also updated rapidly through their inbuilt internet connection and can be updated online [5]. Moreover, the systems of intraoral scanning need a small learning curve for the clinician [7]. Furthermore, intraoral scanners apply ecological sustainability in the dental practice [8]. Regarding the financial aspect, intraoral scanning systems have high purchasing and maintenance costs, however, they need fewer consumable materials and storage space when compared to conventional impressions [1].

The aim of this study was to investigate the effect of using the intraoral scanning from the point of view of dentists and dental lab technicians in Najran region, Saudi Arabia.

2. Materials and methods

A questionnaire survey was conducted among dentists and dental lab technicians in Najran region, Saudi Arabia during November, 2022. This study was approved by Scientific Research Ethics Committee in Health Affairs in Najran Region. The questionnaire of this study consisted of three main sections; the first section included questions about personal information, and the second section included questions about the effect of using the intraoral scan in dentistry, while the third section included questions about the extent of relying on intraoral scanning in dental clinics and labs in Najran region. The questionnaire was formulated in Google forms. The aim of the study was explained at the beginning of the questionnaire, and the researchers pledged

to save the personal data of each participant and not to use the answers except for the study purposes. The questionnaire was sent online to participants and none of them were forced to fill it. 178 of dentists and dental lab technicians completed the questionnaire. Cronbach's Alpha method has been used to calculate the reliability of the data, the reliability coefficient "Cronbach's alpha" was (0.971).

The statistical analysis program (SPSS v.26) has been used in the study in data entry and analysis, with using the necessary statistical methods to achieve the objectives of the study. The following statistical methods were used: frequencies, percentages, graphs, mean, standard deviation, relative Weight, and Cronbach's Alpha.

3. Results

Section I: Socio-demographic characteristics of participants

Of the 178 responds to the study, 121 (68.0%) of them were males and 57 (32.0%) were females, most of participants were between 30-40 years old, 35.4% had working years of more than 16 years, and the vast majority 92.7% were Saudis.

Table (1) Section I: Socio-demographic characteristics of participants.

Variables	N	%
Gender		
Female	57	32.0%
Male	121	68.0%
Age		
Less than 30	43	24.2%
Between 30-40	132	74.2%
Between 40-50	3	1.7%
Years of work		
Less than 5 years	44	24.7%
5-10 years	44	24.7%
11-16 years	27	15.2%
More than 16 years	63	35.4%
Nationality		

Variables	N	%
Saudi	165	92.7%
Other	13	7.3%

Section II: The effect of using the intraoral scan from the point of view of dentists and dental lab technicians.

To measure the efficiency of using the intraoral scan from the point of view of dentists and dental lab technicians, there were (12) items, the item which comes first based on a level of approval is "The use of the intraoral scanning technique facilitates the work" with (M = 4.32 out of 5, RII = 86.4%, SD = 0.94), the item which comes last is "You are aware about intraoral scanners" with (M = 4.02 out of 5, RII = 80.4%, SD = 1.2).

The total degree of the efficiency of using the intraoral scan from the point of view of dentists and dental lab technicians was high (M = 4.19 out of 5, RII = 83.9%, SD = 0.86).

Table (2) The effect of use intraoral scan from the point of view of dentists and dental lab technicians.

Items		S. Disagree	Disagree	Neutral	Agree	S. Agree	Mean	SD	Relative Weight
You are aware about intraoral scanners	N	12	13	16	56	81	4.02	1.20	80.4%
	%	6.7	7.3	9.0	31.5	45.5			
Intraoral scanning handling is easy and comfortable	N	6	8	20	59	85	4.17	1.02	83.4%
	%	3.4	4.5	11.2	33.1	47.8			
My experience of using the intraoral scanning is positive	N	8	2	20	66	82	4.19	1.00	83.8%
	%	4.5	1.1	11.2	37.1	46.1			
Intraoral scanners is easy for training in a short time	N	8	14	16	64	76	4.04	1.11	80.8%
	%	4.5	7.9	9.0	36.0	42.7			
Using the intraoral scanning requires a lot of pre-preparation and adjustment	N	10	2	30	57	79	4.08	1.08	81.6%
	%	5.6	1.1	16.9	32.0	44.4			
The use of the intraoral scanning technique facilitates the work	N	4	6	16	55	97	4.32	0.94	86.4%
	%	2.2	3.4	9.0	30.9	54.5			
The use of the intraoral scanning technique saves time	N	10	2	20	46	100	4.26	1.08	85.2%
	%	5.6	1.1	11.2	25.8	56.2			
Intraoral scanners are comfort for the patient when compared to the conventional methods.	N	4	11	12	56	95	4.28	0.99	85.6%
	%	2.2	6.2	6.7	31.5	53.4			
Intraoral scanners influence on increasing patient's trust	N	9	6	16	49	98	4.24	1.09	84.8%
	%	5.1	3.4	9.0	27.5	55.1			
Intraoral scanners is more accurate when compared to the conventional methods.	N	6	6	21	50	95	4.25	1.02	85.0%
	%	3.4	3.4	11.8	28.1	53.4			

Intraoral scanners can reduce the cross infections when compared to the conventional methods.	N	6	9	14	47	102	4.29	1.04	85.8%
	%	3.4	5.1	7.9	26.4	57.3			
Intraoral scanners can storage infinite digital models when compared to the conventional methods.	N	10	7	14	62	84	4.15	1.10	83.0%
	%	5.6	3.9	7.9	34.8	47.2			
Total							4.19	0.86	83.9%

<u>Section III</u>: Extent of relying on intraoral scanning in dental clinics in Najran region.

Table (3) shows the dentists' distribution according to their use of intraoral scanners in clinics or labs, where we note that 86% of them use intraocular scanners in clinics or labs.

Table (3) the dentists' distribution according to their use of intraocular scanners in clinics or labs.

Do you use intraoral scanners in your clinic or lab?	Frequency	Percent
Yes	153	86.0%
No	25	14.0%
Total	**178**	**100.0%**

Table (4) shows the dentists' distribution according to the scanner they use in dental clinics, 31.5% use Aoralscan, 15.7% use Trios, 12.4% use CEREC, 10.7% use EzScan, 5.6% use I Tero Element, and 10.1% use Other scanner.

Table (4) the dentists' distribution according to the scanner they use in dental clinics.

Which intraoral scanner do you use?	Frequency	Percent
None	25	14.0%
Aoralscan	56	31.5%
Trios	28	15.7%
I Tero Element	10	5.6%
CEREC	22	12.4%
EzScan	19	10.7%
Others	18	10.1%
Total	**178**	**100.0%**

Which intraoral scanner do you use

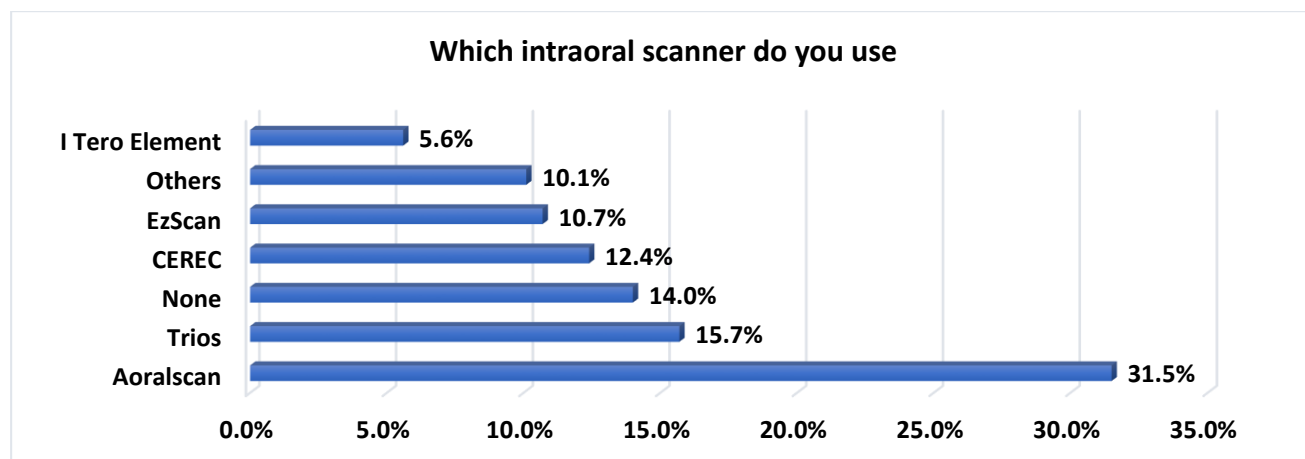| Scanner	Percent
I Tero Element	5.6%
Others	10.1%
EzScan	10.7%
CEREC	12.4%
None	14.0%
Trios	15.7%
Aoralscan	31.5%

Table (5) shows the dentists' distribution according to the light they use while scanning with the intraoral, 33.7% use tube light, 28.1% use Sunlight, 22.5% use chairside light.

Table (5) the dentists' distribution according to the light they use while scanning with the intraoral.

Which light do you use while scanning with the intraoral?	Frequency	Percent
Sunlight	50	28.1%
Tube light	60	33.7%
Chairside light	40	22.5%
No light	28	15.7%
Total	**178**	**100.0%**

Which light do you use while scanning with the intraoral

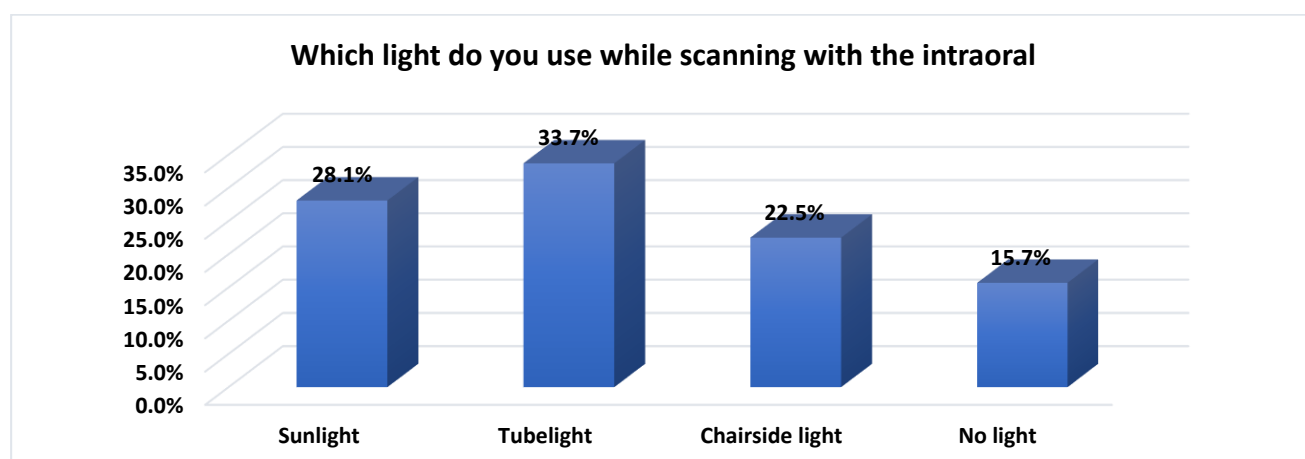| Light	Percent
Sunlight	28.1%
Tubelight	33.7%
Chairside light	22.5%
No light	15.7%

Table (6) shows the dentists' distribution according to their knowledge of the effects of different lights on intraoral scanners, 49.4% know the effects of different lights on intraoral scanning.

Table (6) the dentists' distribution according to their knowledge of the effects of different lights on intraoral scanners.

Do you know the effects of different lights on intraoral scanners?	Frequency	Percent
Yes	88	49.4%
No	24	13.5%
To some extent	66	37.1%
Total	**178**	**100.0%**

Table (7) shows the dentists' distribution according to their knowledge of the unit in which the intensity of light is measured, 79.8% know the unit in which the intensity of light is measured.

Table (7) the dentists' distribution according to their knowledge of the unit in which the intensity of light is measured.

Are you aware about the unit in which the intensity of light is measured?	Frequency	Percent
Yes	142	79.8%
No	36	20.2%
Total	**178**	**100.0%**

Table (8) shows the dentists' distribution according to their knowledge of the indications of intraoral, 64% know the indications of intraoral scanning.

Table (8) the dentists' distribution according to their knowledge of the indications of intraoral.

Are you aware about the indications of intraoral scanning?	Frequency	Percent
Yes	114	64.0%
No	16	9.0%
To some extent	48	27.0%
Total	**178**	**100.0%**

4. Discussion

The use of intraoral scanning is quickly expanded, hence, many clinics use IOS around the world. The interest in intraoral scanning also increased, resulting in the expanding volume of research about it [9]. What prompted the researchers in this study to investigate the efficiency of using intraoral scanning according to dentists' and dental-lab technicians' point of view in Najran region. Through a questionnaire distributed to dentists and dental-lab technicians in Najran region to understand their point of view.

The results of this study showed that there was a positive attitude of dentists and dental-lab technicians towards the effect of using intraoral scanning. These finding are consistent with a similar previous study was conducted in Saudi Arabia by Al-Ibrahim et al. among participating dentists, and found a positive attitude and overall satisfaction toward the use and outcome of IOS in clinical practice [10]. In another study dentists-in-training, Final-year undergraduate Dental Students (FDS), showed a positive perceived toward intraoral scanning [11]. Dental hygienists also gave positive feedbacks after training at IOS [12]. While Lee et al., found that 40% of the clinician group considered the digital impression as the most effective technique, while 53% selected the conventional impression, in the same study [13]. In another study among dental students Wegnera et al. reported that 63.9% of students felt positive to IOS [14]. Lam et al. also reported that 54.6% of final-year undergraduate students preferred IOS [15]. It is worth mentioning here, the acceptance of intraoral scanning by dental students and younger dentists is expected to be higher, because they are more willing to learn new techniques, and have lower technical struggles in adopting digital equipment and software. Moreover the user acceptance of intraoral scanners is

mostly determined by factors such as practice [9], personal and social backgrounds, and innovation perception [15]. Therefore, Many dentists refuse to use these new tools because of a long learning process [9]. But, in our study there was general belief that IOS are easy for training in a short time.

The majority of our participants agreed that intraoral scanning handling is easy and comfortable, and reported that their experience of using the intraoral scanning was positive. These finding are in line with Lee & Gallucci finding that the difficulty of digital impression was lower compared to the conventional ones when performed by inexperience-second-year dental students [16]. But, it is important to know that specific scanners need more extensive training for novice users, especially when opacisation is necessary [11].

Regarding time efficiency, IOS showed a reduced working time compared to conventional impressions [17]. Since in IOS, there is no need to pour the stone casts and wait for their setting any more [18]. In addition to the easily removing of less than ideal areas through recapture or simply re-scanning [19]. Intraoral scanning saves time also through enabling dentists and dental technician to assess the impression quality in real-time of using IOS, through using e-mail [10]. Previous studies proved that the operator experience play an important role in the working-time of intraoral scanning [17, 20]. Resende et al. found that operators with less experiences needed significantly longer times for intraoral scanning compared to operators with moderate and high experiences [20]. In the present study, the majority of participants believe that the use of the intraoral scanning technique saves time.

Intraoral scanning improved the comfort of patient [15, 21]. In addition to present advantages for dental patient safety because it is less invasive than traditional methods

of dental registration [8]. Therefore, it is expected that IOS will increase patient's trust, in the present study it was believed by the majority of participants that intraoral scanning influence on increasing patient's trust.

Using any device without enough knowledge could lead to errors which can impact the results. So, it is necessary to have proper knowledge about intraoral scanning and to aware about all the effecting factors to maximize the potential of this system. In the present study the majority of participants reported that they are aware about IOS. Merchant, Nallaswamy, & Maiti, found similar results that 70.0% of participated dentist were aware about the use of IOS [22].

To maximize the effect of intraoral scanning, it is essential to adjust all the factors influencing it's accuracy. There is a significant influence of ambient light on the accuracy of intraoral scanning, different light conditions can lead to a scanning accuracy difference of 37%-44% [22]. In this study, about half of our participants reported that they know the effects of different lights on intraoral scanning. As well as, the majority of our participants thought they aware about the indications of intraoral scanning and about the unit that use to measure the intensity of light.

In the present study, about 86% of participants reported using intraoral scanners in their clinic or lab. This is higher than what Al-Ibrahim and his colleagues found in their study that 29.4% reported using IOS in their clinics [10]. Merchant, Nallaswamy & Maiti also found in their study that more than half of the participated dentists do not use IOS in their clinical practice [22].Many dentists refuse to use IOS because they believe it will take a long time to learn and it's learning difficulty will be just like the difficulty of learning traditional impression [10], in addition to some clinical limitations with intraoral scanning systems, for example, intra-arch

discrepancy with intraoral scanning could be significant, therefore, it is not recommended for full-arch prostheses in general. Furthermore, in the edentulous patient, the sulcus reflection could be distorted during the scanning process, thus it become unsuitable for the production of complete dentures with adequate border seal [15]. And as mentioned earlier, there are factors affect dentists' acceptance of the use of IOS such as; innovation perception, social, personal and practice backgrounds [15].

This study has some limitations. One limitation is this study is just a cross-sectional study depends on a questionnaire, but clinical studies included patients are needed to obtain more accurate results on the effectiveness of intraoral scanning in dentistry. The second limitation is the limited number of respondents to this study.

5. Conclusion

Although there are limitations to the present study, it showed that dentists and dental-lab technicians in Najran region thought that the using of intraoral scanning in dentistry is effective. Dentists and dental-lab technicians in Najran region are aware about intraoral scanners and it's features. The study revealed also that there a high prevalence of intraoral scanning in dental clinics and labs in Najran region.

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