

THE MOST USED INTRAORAL SCANNERS AMONG DENTISTS IN BULGARIA

Gergana Gurgurova

Orthodontic practice GreOrtho, Sofia, Bulgaria, gerganagurgurova@gmail.com

Iliyan Kostov

Department of Administration and Management, IBSEU-Sofia, Bulgaria, kostoviliyan@gmail.com

Abstract: Intraoral scanners (IOS) are increasingly incorporating daily dental practice. They allow recording of the oral cavity in a few minutes. Thus eliminating the need for conventional alginate impressions, which are often unpleasant for patients, and plaster casts, which are bulky and require storage space. The procedure is fast, pleasant and interesting for the most patients. It allows the creation of a digital patient file containing his digital casts. Orthodontic analysis is facilitated by software that allows the measurement of various orthodontic parameters to be done quickly, accurately and precisely. Communication with the dental laboratory is facilitated and the possibility of a multidisciplinary approach in each clinical case is increased. The aim of the study is to determine the percentage of dentists in Bulgaria working with intraoral scanners and which are the most used intraoral scanners in Bulgaria.

A questionnaire was developed and provided in an online group accessible only to doctors of dental medicine (DDMs). The group includes 3100 DDMs. Of these, 207 colleagues (6.68% of the group members) completed the survey during the period in which it was launched. The data were statistically processed.

207 DDMs, of whom 88 (42.7%) were men and 118 (57.3%) were women, completed the survey. One respondent did not provide the gender. The average age of the participants in the study was 39 years (range 25 to 69 years). Of the 207 DDMs, 91 (44%) responded that they had an intraoral scanner (IOS). From the data, 91 of the respondents own a total of 99 scanners. Of those who completed the questionnaire, 84 own one IOS (84.84% of all those who own IOS), 6 of the DDM's have 2 IOS in their practices (6.06%) and one indicated that they have three IOS (1.01%). Their distribution by brand is as follows: 35 of those who completed the survey have an IOS Medit 35 (35.35% of those who have scanners), 20 have the 3 shape brand (20.20%), 13 owns the iTero (13.13%), 13 owns the CEREC (13.13%), Shining 3d Aoralskan 8 (8.08%), four has Emerald (4.04%), two has Heron (2.02%), Strauman virtuo vivo have one (1.01%), one have 3M intraoral scanner (1.01%) and one have Panda 3 (1.01%).

Over a third of participations in the survey or 44% have an IOS and use it in daily dental practice. This is a high percentage based on data from similar studies in other countries. Nine brands of IOS are widespread, with Medit being over 30% followed by 3 shape, iTero and CEREC, which are in equal numbers. A future literature review comparing the characteristics of the most widely used intraoral scanners would be useful for dental practitioners who are still exploring the market and choosing whether to invest and which IOS would be most suitable for their dental practice.

Keywords: intraoral scanner, survey, digitalization, digital patient record

1. INTRODUCTION

Intraoral scanners (IOS) are increasingly used in daily dental practice. (Yoshiga et al., 2024) (Rutkūnas et al., 2024) (Kihara et al., 2020). They have a number of advantages in various fields of dentistry - they facilitate working with children, making the process faster and more interesting. (Eggmann et al., 2024) They are preferred in patients with a gag reflex. The workflow is facilitated by shortening the manipulations: taking a conventional impression, casting it and delivering it to the dental laboratory. Communication with the dental laboratory, as well as with colleagues, in cases requiring a multidisciplinary approach, is facilitated. (Suese, 2020). Several studies have shown that digital impressions are of shorter duration. This allows for a reduction in working time (and therefore costs) compared to conventional impressions. (Burhardt et al., 2016) (Goracci et al., 2016) (Grünheid et al., 2014) (Joda et al., 2015b) (Joda et al., 2015a) (Joda et al., 2017) (De La Cruz et al., 2002) (Lee & Gallucci, 2013) (Patzelt et al., 2014) (Sakornwimon et al., 2017) (Schepke et al., 2015) Technological advances in IOS and the latest devices introduced on the market allow for a scan of the dental arches in less than 3 minutes. Conventional impressions take between 3 and 5 minutes. The difference in the time for the impression is not large. The difference and time efficiency comes from all the steps that follow after taking the conventional impression until obtaining and storing the plaster model. (Goracci et al., 2016), (Grünheid et al., 2014), (Lee & Gallucci, 2013) When scanning for a digital impression, the out-of-clinic stages and the occurrence of technological and human error that can occur when sending to the laboratory, casting from plaster and storing the physical plaster models are eliminated. (Ahlholm et al., 2018) (Aragón et al., 2016) (Joda et al., 2017) (De La Cruz et al., 2002) (Zimmermann et al., 2015). The ability to directly capture the patient's dental profile and generate 3D models without using conventional impressions is one of the advantages of digital impressions. (Chochlidakis et al., 2016) (Imburgia et al., 2017) (Ting-shu et al., 2015) In

fact, conventional impressions can cause momentary discomfort to the patient due to inconvenience and difficulties arising from the impression materials. (Ting-shu et al., 2015) Some patients (e.g. patients with a strong gag reflex or children) seem to not tolerate conventional impressions. (Christensen, 2008) (Joda et al., 2016)(Marti et al., 2017)(Martin et al., 2015)(Zimmermann et al., 2015). For such patients, replacing conventional impression materials with light is an advantage. (Means et al., 1970), (Rosted et al., 2006) Optical impression significantly reduces patient discomfort compared to traditional conventional impression. (Burhardt et al., 2016) (Grünheid et al., 2014)(Joda et al., 2016) (Sakornwimon et al., 2017) Eliminates the need for impression trays, which are often undesirable for the patient. (Means et al., 1970) (Rosted et al., 2006). Each IOS has advantages and disadvantages, depending on the field and specifics of the work for which it will be used. There is a wide variety of IOS on the market, in approximately similar price ranges. It is difficult, if you are just starting the digitalization of your practice, to focus and choose the most suitable one.

The aim of the study is to determine the percentage of dentists in Bulgaria working with intraoral scanners and which are the most used intraoral scanners in Bulgaria.

2. MATERIALS AND METHODS

A survey was developed and provided in an online group, accessible only to doctors of dental medicine (DDMs). The Google Forms platform was used for the survey, and the completed information is transmitted through the platform only to the researcher and cannot be manipulated. The group includes 3,100 dental practitioners. Of these, 207 colleagues (6.68% of the group members) completed the survey during the period in which it was launched. Of these, 88 (42.7%) were men and 118 (57.3%) were women, one of the respondents did not enter. The average age of the participants in the study was 39 years (ranging from 25 to 69 years). The data were statistically processed. (Table 1). All the data, tables and figures used in this article are our own - author research.

Table 1. Distribution by gender and average length of service of the participants

DDM	Gender			Average time of work experience
	female	male	No answer	
207	118	88	1	13.88 years

Source: author research.

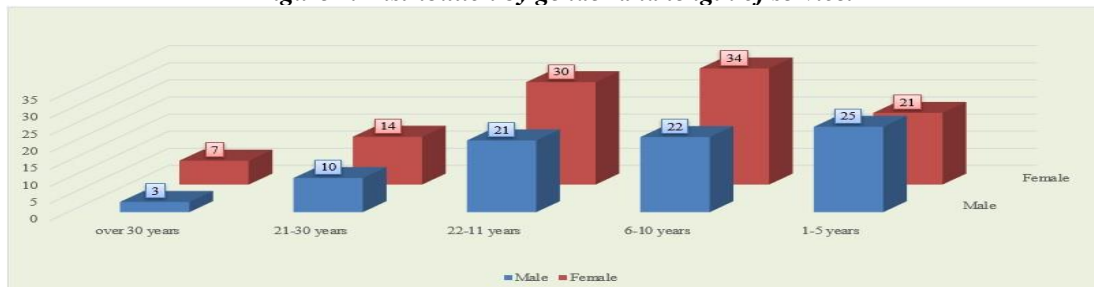
The survey was completely anonymous, but included information on years of work experience and gender. The instructions given to respondents were to mark only one preferred answer or the given numerical scale for reporting levels of preference. Some of the questions were open-ended. For four questions, it is possible to mark more than one answer.

The results of the completed surveys were subjected to descriptive statistical analysis and summarized by the percentage ratios of the answers to each question. A non-parametric method – chi-square analysis – was applied to determine associations between the individual answers of the respondents. A value of $p < 0.05$ was adopted as the level of significance.

3.RESULTS

A total of 207 dental practitioners (DDMs) participated, of whom 88 (42.7%) were male and 118 (57.3%) were female, who voluntarily completed the survey. One respondent did not provide their gender. The average age of the participants in the survey was 39 years (range 25 to 69 years).

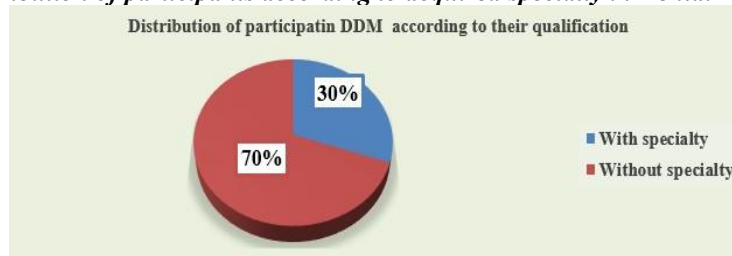
Figure 1. Distribution by gender and length of service.



Source: author research.

The survey included participants with different lengths of work experience as dentists. Fig. 1 shows that the largest representation is among DDMs with an average work experience between 1-5 years and 6-10 years with an equal number of participants (56 – 27%), followed by those with 11-20 years (51 – 24.6%). DDMs with longer work experience are probably not the most active users of electronic networks and therefore their group is smaller (24 and 10 respondents, respectively). The distribution according to this criterion is shown in Figure 1. The distribution according to DDM qualification – with or without specialty is shown in Figure 2.

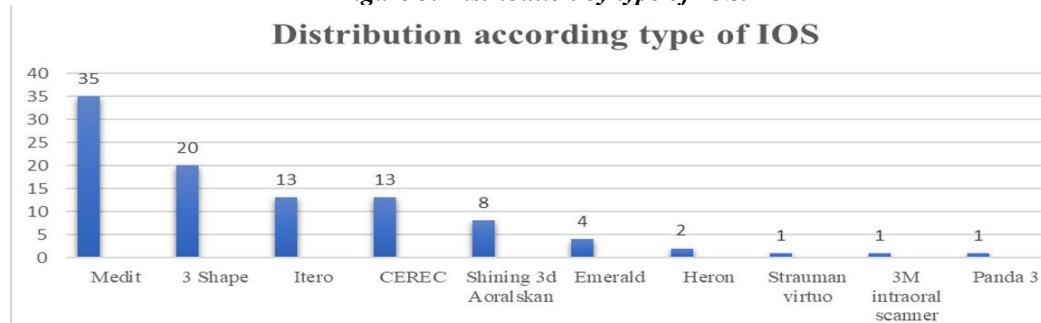
Figure 2. Distribution of participants according to acquired specialty in Dental Medicine.



Source: author research.

Of the 207 DDM, 91 (44%) responded that they had an intraoral scanner (IOS). From the data, 91 of the respondents owned a total of 99 scanners. Of those who completed the questionnaire, 84 owned one IOS (84.84% of all IOS owners), 6 of the DDMs had two IOSs in their practices (6.06%) and one indicated that he had three IOSs (1.01%). Their distribution by brand is as follows: 35 of those who completed the questionnaire had an IOS Medit 35 (35.35% of those who had scanners), 3 had a brand of shape 20 (20.20%), 13 had iTero (13.13%), 13 also had CEREC (13.13%), Shining 3d Aoralaskan 8 (8.08%), Emerald 4 (4.04%), Heron 2 (2.02%), Strauman virtuo vivo 1 (1.01%), 3M intraoral scanner 1(1.01%), Panda 3- 1(1.01%). (Figure 3)

Figure 3. Distribution by type of IOS.



Source: author research.

From the owners of Medit IOS, four are with Medit i500, 19 are with Medit i 700 and 12 are not concretize the model. For 3 shape the distribution according to model is: 3 shape trios 3 is owned by 9 doctors, 3 shape 5 by 2 and 9 are not concretize the model. iTero 5 is used by 2, the other from iTero’s group are not concretize the model. Omnicam Sirona is used by 6, Primescan by 2 and 5 are not concretize which modes is their scann by CEREC.

4. DISCUSSION

Digital impressions are a powerful tool for patient communication and direct marketing. (Kim et al., 2016), (Lim et al., 2018). During digital impressions, patients are directly involved in the process and feel that they have active part in their treatment. It is possible to establish more effective communication with them. This emotional involvement can have a positive impact on the overall treatment, for example by improving patient awareness and motivation for hygiene. In addition, patients are interested in technology and turn a visit to the dental practice into a topic of conversation with acquaintances and friends, increasing their attention to dental centers equipped with these modern technologies. Indirectly, IOS becomes a very powerful advertising and marketing tool. (Goracci et al., 2016) (Joda et al., 2015b) (Joda et al., 2015a) (Lecocq, 2016) (Lee & Gallucci, 2013), (Lee, Macarthur IV, et al., 2013) (Park et al., 2015) (Patzelt et al., 2014). Intraoral scanners are well accepted by patients and most prefer them to conventional impressions. (Yordanova et al., 2021) On the other hand, the digitalization of dental practice is an inevitable process.

(Yordanova et al., 2023) The introduction of digital models into everyday practice is a first step. The choice of IOS is related to the software for processing diagnostic data and the process of designing future treatment appliances or devices. Therefore, this should be a conscious process by dental practitioners.

5. CONCLUSION

Over a third of the study participants or 44% have an IOS and use it in daily dental practice. This is a high percentage based on data from similar studies in other countries. Nine brands of IOS are widespread, with Medit being the most popular with over 30%, followed by 3 shape, iTero and CEREC, which are in equal numbers. Certainly, digitalization and modernization are the way to the future and every area of life, including dentistry, is transforming and evolving with each passing day. The present study reveals which are the most common and used scanners among doctors in Bulgaria. A future literature review comparing the characteristics of the most widely used intraoral scanners would be useful for dental practitioners who are still exploring the market and choosing whether to invest and which IOS would be most suitable for their dental practice.

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