

ARTICLE

A cross-sectional survey to evaluate acquaintance about dental photography among dental students in daily clinical practice

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Abstract

Background: In today's world of digital dentistry, dental photography plays an important role as multilevel significance and represents the synonym of contemporary dentistry. Thus, we aimed at evaluating the acquaintance of practice, opportunity and morals of dental photography in everyday practice among undergraduate dental students.

Design and Methods: The current research was an observational cross-sectional study. Total 233 students participated; each was given questionnaire consisted of three parts covering the following aspects: questions 1 to 3 on the practice of dental photography, questions 4 to 7 on morals in dental photography and question 8 to 11 on opportunities of dental photography. The answers were tabulated and statistically analysed and association with the factors were tested for significance using Chi-square tests, and $P < 0.05$ was considered statistically significant.

Results: The total response rate was 86%. Among the 201 respondents, 100 were males and 101 females; 96% male students were taking photographs and 93% females were taking photographs, on regular basis. Phone cameras (41.3%) were the most commonly used device followed by DSLR cameras. Surveyed students mentioned patient education (53.2%) as most needed requirement for taking photographs, followed by treatment planning (49.8%) and monitoring of the treatment outcome (34.3%). Ninety-one percent of students feel that there is an opportunity for advancement in dental photography techniques.

Conclusions: The participants aware of dental photography, but they require detail insight on proper capturing of photographs and morals, with regards to confidentiality of the patient and patient consent.

Introduction

Dental practice has now evolved to an extent where the final results can be seen even before starting the treatment: all this is

possible with the advancement of digital dentistry. In this part, the dental photography plays an important role. With the help of digital photographs, the step by step modifications and progress of treatment can be assessed pre-operatively. Basically, photography is a science and art of recording the images.¹ Dental photography is a sub branch of it and has become an indispensable part of modern dentistry, the modern equipment, advanced technologies has refined and made it easier for the dentists to apply it in their day to day dental practice.

Dental photography should be regarded as a diagnostic tool, similar to radiographs, study casts or other investigations and tests. Ideally before taking any pictures it is essential to obtain written consent for permission and retain confidentiality of the patient.

The primary purpose of digital dental photography is recording the clinical manifestations of the oral cavity. As a spin-off, secondary uses include the following:²⁻⁸ i) dento-legal documentation of cases; ii) for diagnosis and treatment planning; iii) dental education for guiding and training of staff and students; iv) training and motivation of the patient; v) facilitation of communication with the patient, laboratory, colleagues, and insurance companies; vi) for portfolios, advertising and marketing purposes; vii) referral to specialists, particularly in cases of suspected pre-cancerous or malignant lesions.

A photographic record serves as a constructive purpose for many disciplines, like, analysing facial profiles and tooth alignment for orthodontics, assessing occlusal disharmonies, deciding methods of prosthetic rehabilitation for restoring tooth wear, observing periodontal health or ridge morphology prior to implant placement, aesthetic dentistry, etc. In the field of forensic dentistry, photographic documentation is an essential piece of evidence. Similarly, taking pictures for suspected cases of child, domestic or sexual abuse is also indispensable proof. Photographs can be traced, or marked with indelible pens to communicate salient features such as shape, alignment, characterizations, regions of translucency or defining features such as mamelons, banding, calcifications, prosthetics, etc.

Dental photography is also helpful to students in preparation

Significance for public health

Taking pictures in dentistry is not only capturing an object. It is an art where clinician should be able to capture the details of the concern area and the image should be self-explanatory. Especially taking an intra-oral picture requires proper equipment's, correct camera settings, flashes, reflectors, and mirrors etc, these all are not taught in routine dental courses. Thus, each dentist needs additional training and knowledge in this field.

and enhancement of presentations involving clinical case studies, and forms an integral part of lecturing for those wishing to pursue academics in future.

Common photographic tools used in Dentistry include: i) mobile phones; ii) cameras (DSLR, compact cameras); iii) intra-oral cameras.

Cairns, in his study of 2016,⁹ stated that the photographic tool can be categorized into 3 parts upon their quality, that is: Good = Smartphone accessories, which can enhance a smart phones photography capability for dental images; Better = Point-and-shoot digital camera with macro lens and diffuser; Best = Digital single-lens reflex (DSLR) camera with macro lens and multiple flash option. Digital photography has multilevel significance and represents the synonym of contemporary dentistry. The major advance in dental photography centres on the shift from film-based photography to digital imaging. Most of dentists and students are fascinated with it but are they really using it efficiently, this needs a clear assessment. In dentistry, we don't have a particular course or section at any level where the digital dental photography is taught and discussed to the students. Because of that even in today's digital world, most of us are reluctant to implement digital dental photography in their daily practices for reasons such as lack of knowledge of photography, its equipment and technique, interruption in workflow, and cost factors. However, as new technologies are continuously emerging, the equipment cost is declining as well, thus every practitioner can implement photography into his or her practice with minimal interruptions in their patient workflow.

Thus, to understand the acquaintance about the practice, morals and opportunities of Dental Photography among Undergraduate Dental Students and interns at King Khalid University, college of dentistry (KKUCOD) this study was conducted. Also, based on the results of the study, recommendations were made to enhance the knowledge of students in digital dental photography so that they can use this in their clinical practice efficiently.

Design and Methods

The current research was an observational cross-sectional type of study where the data were collected from the representative population at a specific time interval of 3 months from March 1st, 2019, to May 31st, 2019. It was undertaken to evaluate the acquaintance about the practice, morals and opportunities of dental photography in dental practice among undergraduate dental students of 5th and 6th years (corresponding to level 9 to 12) and dental interns at KKUCOD. The chief researcher along with the co-researchers collected the data.

Ethical considerations

This study was conducted in compliance with the protocol; ethical approval was obtained from the ethical committee of the King Khalid University, College of Dentistry (Ethical Approval Number – SRC/ETH/2018-19/086). The subjects participating in the present study provided their informed written consent before taking the survey by signing the consent form attached to the questionnaire. Participation was on a voluntary basis, and there were no incentives. Data protection and anonymity were guaranteed.

Questionnaire

The questionnaire designed for this study was adopted from previous studies.^{9,10} It included YES/NO and multiple-choice questions. The questionnaire set consists of 11 questions. The ques-

tionnaire's validity and reliability was evaluated by four prosthodontists for vetting and remarks. The recommended modifications were implemented to ensure its cogency. Also, the questionnaire was validated by doing a pilot study on 25 participants. After analyzing the dataset, consistent responses were noticed, this depicted high internal consistency for the questionnaire, with a Cronbach's Alpha value of 0.74.

The questionnaire consisted of three parts covering the following aspects: questions 1 to 3 on the practice of dental photography, questions 4 to 7 on morals in dental photography and question 8 to 11 on opportunities of dental photography. These questionnaires were given personally to the participants. Each participant's communication data were collected and coded. At an interval of every 1 week for two times, all participants were reminded to return the questionnaire forms with their responses. If necessary, an essential detailed conversation was conducted with the respondents and clarification was provided regarding the study and its goals.

Statistical analysis

To achieve the outlined objectives, the scores were calculated based on the responses given by the participants. A single investigator analyzed all returned questionnaires. A database was constructed using Microsoft Excel (Microsoft, Redmond, WA, USA) and imported into the Statistical Package for Social Sciences (SPSS) version 20 (Chicago, IL, USA) for statistical analysis. Descriptive statistical analysis, which included frequencies and percentages, was used to characterize the data and report the diversity of the sample employed in this research. Association with the factors was tested for significance using Chi-square tests, and $P < 0.05$ was considered statistically significant. The opinions with abnormally high proportions and relatively higher knowledge levels were evaluated by the control chart technique. Bar graphs, multiple bar graphs and pie charts, etc., were constructed to visualize various summaries of the data and findings.

Results

Out of 233 participants, 201 gave their responses. Thus, the total response rate was 86%. Among the 201 respondents, 100 were males and 101 females. Among the surveyed undergraduates 96% male students were taking photographs and 93% females were taking photographs, on regular basis (Figures 1 and 2).

Phone cameras (41.3%) were the most commonly used device to take dental photographs, followed by DSLR cameras. Surveyed students mentioned patient education (53.2%) as most needed requirement for taking photographs, followed by treatment planning (49.8%) and monitoring of the treatment outcome (34.3%). Both undergraduate and interns were aware of consent requirement before taking patient photographs and almost 93.5% of participants were obtaining consent before taking photographs. But most of them were taking verbal consent (83.9%) while only 21% took written consent and just 9% took both. Participants were maintaining the confidentiality of the patient in presentations and Research publications (85.1%) by preferably editing the photographs with photoshop software (44.4%) and secondly by covering eye of the patient (26.3%).

The 77% of surveyed students attended the dental photography course before and most of the attended courses were the workshop conducted in college campus in dental photography. Students were enthusiastic in attending the dental photography courses in future and more than 91% students feel that there is an opportunity for advancement in dental photography techniques (Tables 1-3).

Discussion

In today's world it would be difficult to imagine any form of our existence that is not associated with photography. Its century and a half long history represents a turning point in the development of society, making life of people more rich and comprehensive. The opinion of the majority prevails that photography has influenced the conscience of people so much that the saying *an image is worth a thousand words* is accepted as an irrefutable fact. In dentistry, photography has an enormous opportunity and with development in digital technologies it has become user friendly also.¹⁰

The awareness about the practice, morals and opportunity of dental photography of the dentist is of utmost importance in evidence based dentistry. This should be implemented at a very starting level to budding dentist so it will not be taken as burden but considered as a routine practice in clinical setup. So this study was undertaken to assess the same about dental photography among

undergraduate dental students and interns at KKUCOD. Results of the study showed, high awareness about dental photography among the surveyed among undergraduate dental students and interns, similar results were reported in previous studies.¹⁰⁻¹² Thus imposing the fact that students are interested towards dental photography and it has a useful place in clinical practice.

The present study had a high response rate of more than 86% noted which was high compared with those previously reported comparable studies, of between 54% and 82%.^{9,10} The high response rate may be because the questionnaire was distributed and collected personally and participants were informed twice for the same also sufficient response period, viz. 2 weeks, was given to allow participants to answer and return the questionnaire.

Demographic data showed that the male dentists were more than double to their female counterpart demarcating the need of more female dentists in this area. Thus enhancement of awareness and acceptance of dental photography would be easy and would grow exponentially. These young dentists when detailed

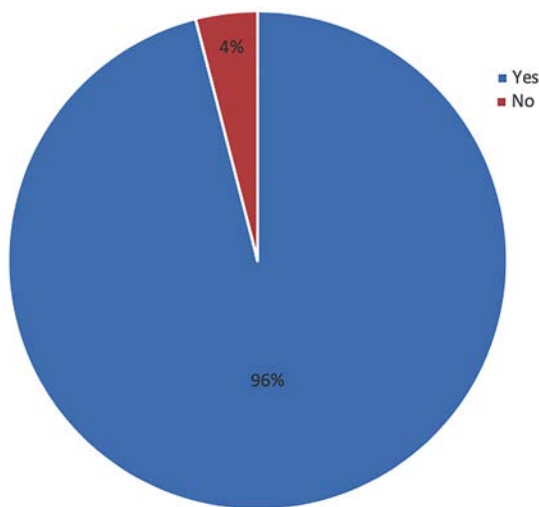


Figure 1. Overall prevalence of having consent for doing dental photography by undergraduate dental students and interns at King Khalid University.

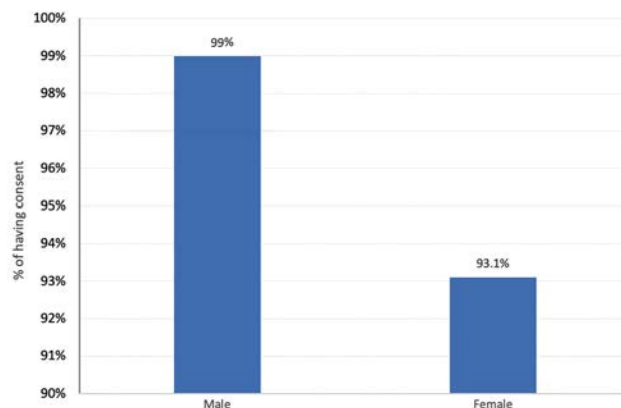


Figure 2. Prevalence of having consent for doing dental photography by undergraduate dental students and interns according to gender at King Khalid University.

Table 1. Practice of dental photography among undergraduate dental students and interns at King Khalid University.

Practice of dental photography		Total (%)	Qualification				P
			Undergraduate		Intern		
			No	%	No	%	
If yes, how do you take the photographs? (can select more than one options)	DSLR	39 (19.4)	31	19.1	8	20.5	0.931
	Digital camera	10 (5)	8	4.9	2	5.1	
	Phone camera	83 (41.3)	68	42.0	15	38.5	
	DSLR+phone	34 (16.9)	26	16.0	8	20.5	
	Digital phone	28 (13.9)	24	14.8	4	10.3	
	DSLR+digital+phone	7 (3.5)	5	3.1	2	5.1	
What are the reasons for taking a dental photograph?	For patient education	107 (53.2)	79	48.8	28	71.8	0.010*
	For treatment planning	100 (49.8)	72	44.4	28	71.8	
	To monitor the treatment outcome	69 (34.3)	56	34.6	13	33.3	
	For study/ research purpose	67 (33.3)	54	33.3	13	33.3	
	For medico legal reasons	6 (3)	5	3.1	1	2.6	
	For publicity and advertisements	42 (20.9)	32	19.8	10	25.6	

P, Monte Carlo exact probability; *p<0.05 (significant).

about dental photography at this stage, they will be utilizing this concept often and with experience level of awareness will be increasing.

Awareness about practice of dental photography

Smartphones have become the easiest and most practical tool for dental documentation. In all cases, light should be correctly managed in order to achieve a perfect picture. The study results showed high awareness among the studied population, >92% participants (both male and females) were taking pictures mostly using phone camera (43%) followed by DSLR camera. One of the main reasons behind it is the availability of high quality camera in phone making it very easily assessable with good quality pictures.

The most common need of dental photographs imposed by the studied population was treatment planning followed by monitoring of treatment outcome. According to the survey conducted by Horn *et al.* about the applications of photography in pathology, the most common application was for educational purposes followed by medical recording and consultation services.¹³

These results were in association with the study by Rabea Basri *et al.*¹⁰ and Hannah *et al.*¹¹ where dental students use their mobile cameras when dealing with their patients.

A special mention needs to be given to dental photography

practice methods and tools used. It requires strict adherence to cross-infection control measures. It is recommended that a specific zone be reserved for photographic equipment and accessories. All photographic equipment, including the camera, lens, tripod and cable releases should be draped with disposable cellophane covers, similar to that used for dental chair headrests. Cheek retractor scan either be autoclaved or cold sterilised. Intra-oral mirrors should be cleaned with cotton gauze soaked in a mild surface disinfectant. Finally, all intra-oral photographic reflector and backdrop cards should be discarded after use.

General guidelines prior to photography include the following: the first step is making the patient wear safety glasses. Unless stains or bio-film is being photographed, the teeth should be flossed and polished with prophylaxis paste to remove food debris, plaque and stains which mask intrinsic tooth shade and texture. In order to facilitate placement of cheek retractors, petroleum jelly is copiously applied to the lips, taking care not to smear the teeth. This lubrication also prevents chapping of the lips while they and the cheeks are displaced by the retractors. After placing the cheek retractors, the patient is given tissues to wipe excess salivary flow. A dry oral environment is achieved using saliva ejectors and cotton wool rolls, they can be discretely placed so are invisible in the photograph. Photographing the oral soft tissues is similar to pho-

Table 2. Consent for practice of dental photography among undergraduate dental students and interns at King Khalid University.

Dental photography practice consent		Total (%)	Qualification				P
			Undergraduate		Intern		
			No	%	No	%	
Do you take consent from the patient before taking the photograph?	Yes	186 (92.5)	151	93.2	35	89.7	0.460
	No	15 (7.5)	11	6.8	4	10.3	
If yes, what type of consent?	Written	21 (11.3)	17	11.3	4	11.4	0.832
	Verbal	156 (83.9)	126	83.4	30	85.7	
	Both	9 (4.8)	8	5.3	1	2.9	
Do you maintain the confidentiality of the patient in presentations/ research publications/ social forum?	Yes	171 (85.1)	136	84.0	35	89.7	0.362
	No	30 (14.9)	26	16.0	4	10.3	
If yes, how do you maintain the confidentiality?	Cover the eyes of the patient	45 (26.3)	37	27.2	8	22.9	0.261
	Mask the unique features of the patient	10 (5.8)	10	7.4	0	0.0	
	Photoshop the photograph	76 (44.4)	60	44.1	16	45.7	
	13.00	40 (23.4)	29	21.3	11	31.4	

P, Monte Carlo exact probability.

Table 3. Opportunity of dental photography among undergraduate dental students and interns at King Khalid University.

Opportunity of dental photography		Total (%)	Qualification				P
			Undergraduate		Intern		
			No	%	No	%	
Are you aware of a course called dental photography?	Yes	155 (77.1)	121	74.7	34	87.2	0.048*
	No	46 (22.9)	41	25.3	5	12.8	
If yes, have you attended any course in dental photography?	Yes	92 (59.4)	68	56.2	24	70.6	0.134
	No	53 (34.2)	43	35.5	10	29.4	
	In future	10 (6.5)	10	8.3	0	0.0	
If yes what type of course did you attend?	Online course	8 (8.7)	7	10.3	1	4.2	0.910
	Workshop at college	34 (37)	25	36.8	9	37.5	
	Private workshop	23 (25)	17	25.0	6	25.0	
	Private and at college	23 (25)	16	23.5	7	29.2	
	All	4 (4.3)	3	4.4	1	4.2	
Do you think there is opportunity for advancement in dental photography?	Yes	184 (91.5)	148	91.4	36	92.3	0.848
	No	17 (8.5)	14	8.6	3	7.7	

P, Monte Carlo exact probability; *p<0.05 (significant).

tographing teeth but requires minor modifications in technique. Extra care is necessary to avoid trauma when placing retractors and mirrors if the tissues are inflamed and patient exhibits pain. Mirrors are essential if pathological lesions are located in the deep recesses of the oral cavity. However, if trismus is present mirrors are not recommended for safety reasons and because of limited access. For maximum comfort and depending on the site of the lesion, the patient can either be seated or placed in the supine position. If not contra-indicated, administration of topical or injectable local anaesthesia helps alleviate pain and expedite the photograph session.¹⁴

Awareness about morals of dental photography

It is the right of every human that before using their related information consent should be obtained. In the same way, picturing any person necessitates their permission. In dentistry, we take pictures of individuals for many reasons viz. education, publication, demonstration thus it is compulsory to take permission from the patient. This permission is taken in the form of consent. In the present study, 92.5% participant affirm that they take consent from patient before taking their pictures, which is good practice as this shows that they are concern about the patient respecting their rights.

The consent is basically two types, verbal and written. It is always better to have written consent form the patient before taking photographs, as this would not only be useful to education and publication purpose but also acts as a proof in court of law for medico- legal needs. The studied group in our study were taking verbal consent (83%), which would not be a suitable practice and students should be stress upon to take written consent from the beginning of their career, by supervisors so that this could be inculcated in their practice itself. Obtaining consent is a major concern for significant numbers of dentist but most of them do take verbal consent. The study conducted by Taylor *et al.* among plastic surgeons also noticed that consent was usually taken by surgeons but only in a verbal form.¹⁵ According to the survey conducted by Bhangoo *et al.* in 117 emergency departments in UK, only 21 departments were found to have a written policy for photography.¹⁶ The consent form should include the purpose of documentation and information about the right of the patient to withdraw consent at any time until information has been released to the public.¹⁵ Lau *et al.* noted that using medical photographs on the internet such as medical web sites were generally less acceptable to patients. So these patients could withdraw their consent at any time.¹⁷

Nowadays many journals demand written consent prior to publishing a photograph.¹⁸ For photographing internal organs and microscopic details, permission of the patient is not necessary, but do not record the patient's name with the stored images.¹⁹ Although consent is not required for an anonymized image to be used for educational or solely treatment purpose, the existence of a written statement provides legal protection whenever necessary. If the patient is unable to give consent, the photograph cannot be published until the patient has the capacity to give the consent. If the patient is permanently incapacitated, the immediate family member can give the permission.^{16,20}

The confidentiality in patient photos should be maintained even the consent was taken until it is utmost importance to show complete picture. A significant number of participants (>85%) understand the importance of confidentiality in patient photographs. The participants most commonly used Photoshop software to conceal the photograph of the patient (44%) followed by covering the eyes of the patient (26%) and masking the unique features of the patient (5%). However, Taylor *et al.* noted that

attempts to impart anonymity to patient photos were less frequent among surgeons who participated in their study.¹⁵ Identifiable photographs not only include images involving patient's face, but also apply to images displaying any identifiable features such as jewellery, tattoos, skin lesions scars, etc. So blackening or pixelating the eyes in the images cannot be considered completely anonymous if any other identifiable features are present.

Awareness about opportunity of dental photography

Taking pictures in dentistry is not only capturing an object. It is an art where clinician should be able to capture the details of the concern area and the image should be self-explanatory. Especially taking an intra-oral picture requires proper equipment's, correct camera settings, flashes, reflectors, and mirrors etc., these all are not taught in routine dental courses. Thus, each dentist needs additional training and knowledge in this field. In this study 77.1% of the respondents have attended a course in dental photography. Of those who have attended a course, 37% was at a workshop conducted in college and 25% private course and 8% online courses. In a survey conducted among general medical practitioners in UK by Morse *et al.*, 16.1% of respondents had attended a course in dental photography.²¹ Participants were enthusiastic about dental photography and they felt that there is opportunity for advancement in dental photography. Most of them suggested the inclusion of a course related to dental photography in regular BDS curriculum. Another study was conducted to assess the knowledge, importance and attitude of undergraduate (UG), postgraduate (PG), and FDS (fellowship) students toward dental photography, by asking a series of questions. Around one third of the students felt that case documentation is useful for medico legal purposes and about half of them preferred Dental photography as a mode of documentation. It was also found that about 56% of the student's record cases on mobile phones and dedicate not more than 5 min for photographic documentation. Majority of the students felt that there is no need for advanced training or accessory equipment for dental photography.²²

Recommendations

Through the results of the study it is recommended that dental students should understand the importance of dental photography and efforts should be made to include this topic in detail in undergraduate studies, frequent CDE programmes, workshops and seminars should be conducted to impart training in this expertise and to enhance the knowledge about it. Students should be encouraged to document the cases and research with photographs with appropriate instruments and accessories for capturing standard photographs.

Limitations

The targeted sample was 233 inclusive of all dental student from level 9,10,11,12 and interns. The response rate was 86% (201 respondent). The limitation is based the total number of students and single institute. It will be better to collaborate with government agencies to cover the maximum institutes in kingdom of Saudi Arabia and also inclusion of practicing dentists so that exact scenario can be determined about awareness related to the dental photography.

Conclusions

This study has revealed that the participants were aware of dental photography. However, they require detail insight on proper

capturing of photographs and morals, with regards to confidentiality of the patient and patient consent. This will help in better documentation and treatment for the patient. Making dental photography a choice of interest in dentistry will help students to successfully record cases and have a better opportunity in teaching, stimulus for patients and recall visit. Also, a short term pre-clinical course is the need of the hour.

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