

Original Research

Comparative Evaluation of Effectiveness and Preferences between Smartphone Cameras vs. DSLRs in Clinical Dental Photography

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ABSTRACT:

Background: Digital dental photography serves as a multifaceted tool, pivotal for precise clinical documentation, legal purposes, education, communication, marketing, and elevating dental practice standards for enhanced patient care and service delivery. **Methods:** A structured questionnaire was designed to evaluate dental professionals' preferences and assess the quality of images produced by the Canon 200D, Samsung S22 Ultra, and iPhone 15 Pro Max for intraoral and extraoral dental photography. **Results:** A significant portion of the research population favors using smartphones for dental photography. Moreover, when evaluating visual perception, the Samsung Galaxy S22 Ultra has demonstrated superior results compared to both Canon 200d and the iPhone 15 Pro Max. **Conclusions:** The rapid advancements in smartphone technology have transformed their cameras into user-friendly alternatives to DSLR cameras.

Keywords: DSLR, SMART PHONE, DENTAL PHOTOGRAPHY

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INTRODUCTION

Digital dental photography serves as a pivotal tool in capturing precise clinical details within the oral cavity. Beyond its primary function, its versatile applications encompass legal documentation, publication, education, and effective communication among patients, dental professionals, colleagues, and technicians. Moreover, it extends its reach into enhancing marketing strategies. These diverse utilities collectively elevate the standard of dental practice, facilitating improved patient care and bolstering the overall delivery of dental services.¹

Photographs taken using either a DSLR (Digital Single-Lens Reflex camera) or a smartphone camera serve as a precise and effective means of communication between dentists, patients, and technicians, conveying objective information accurately.

When considering DSLR versus mobile dental photography (MDP), several key differences emerge. DSLR cameras offer extensive control over settings

such as aperture, exposure time, and ISO sensitivity. This level of control allows photographers to dictate the protocols for capturing images, ensuring precision and customization in the process.²

On the other hand, mobile phone cameras, being the primary tool in MDP, operate primarily on automatic adjustments. This feature grants users the ability to swiftly capture images in varying conditions, simplifying the process significantly.³ However, this automatic nature can also pose challenges. Users lacking expertise in manipulating smartphone camera settings might inadvertently produce distorted images due to unintended adjustments.⁴

The shift towards mobile devices for dental photography among clinicians is driven by factors such as cost-effectiveness, lightweight design, and ease of use.² While DSLRs offer greater control over photographic variables, the accessibility and simplicity of mobile cameras make them increasingly practical for routine procedures, reflecting their rising popularity among dental professionals.⁵

This study aims to explore the preferences of dental professionals regarding the use of dental photography in their daily practice. Additionally, it seeks to evaluate and compare the effectiveness of flagship smartphone cameras with DSLR cameras for dental photography purposes.

METHODOLOGY

This study was conducted in the Department of Pediatric and Preventive Dentistry at Ahmedabad Dental College and Hospital during September 2023 – October 2023.

This study aims to explore the preferences of dental professionals regarding the use of dental photography in their daily practice. Additionally, it seeks to evaluate and compare the effectiveness of flagship smartphone cameras with DSLR cameras specifically for dental photography purposes.

To ensure the ethical conduct of this study, ethical approval was diligently obtained from the Institutional Review Board, confirming the strict adherence to ethical standards.

A structured questionnaire has been meticulously crafted to evaluate the quality of images generated by three different devices used in dental photography: the Canon 200D, Samsung S22 Ultra, and iPhone 15 Pro

Max and to know the preference and approach of dental professionals toward dental photography.

The imagery collection process involved capturing five sets of intraoral photographs of the same subject, encompassing views of the maxillary and mandibular arches, front occlusion, right-side occlusion, and left-side occlusion. Each set of images was obtained using the devices. Furthermore, two extraoral photographs, one showcasing a zirconia crown on a cast and another featuring a denture were taken using the same trio of devices.

Consistency was maintained throughout the photography sessions, with a consistent dental photographer and assistant utilizing standard tools such as stainless-steel mirrors and cheek retractors. The methodology encompassed employing the auto mode with built-in flash for capturing images using the Samsung S22 Ultra and iPhone 15 Pro Max. For DSLR photography with the Canon 200D, standard manual controls and rules were meticulously followed.

A total of 21 images were collected seven from each device and anonymously labelled as options 1, 2, and 3. Participants in the questionnaire were tasked with selecting the image they deemed best based on their visual perception and professional judgment. (figure 1)

Figure 1: Images captured from 3 different devices.



This structured questionnaire, designed in the form of a Google Form, will be distributed among dental professionals (BDS, MDS and post graduate student) in Ahmedabad city to gather insights into their preferences towards Dental photography and assessments regarding the quality of images produced by these devices for dental photography purposes.

RESULTS

The data analysis for this study was conducted using IBM SPSS software version 20. Categorical variables have been presented in terms of frequency (n) and percentage (%). The study comprises a total of 118 participants. Demographic data distribution according to age, years of experience and branch of dentistry were tabulated. (Table 1)

Table 1: Demographic Data of a study population

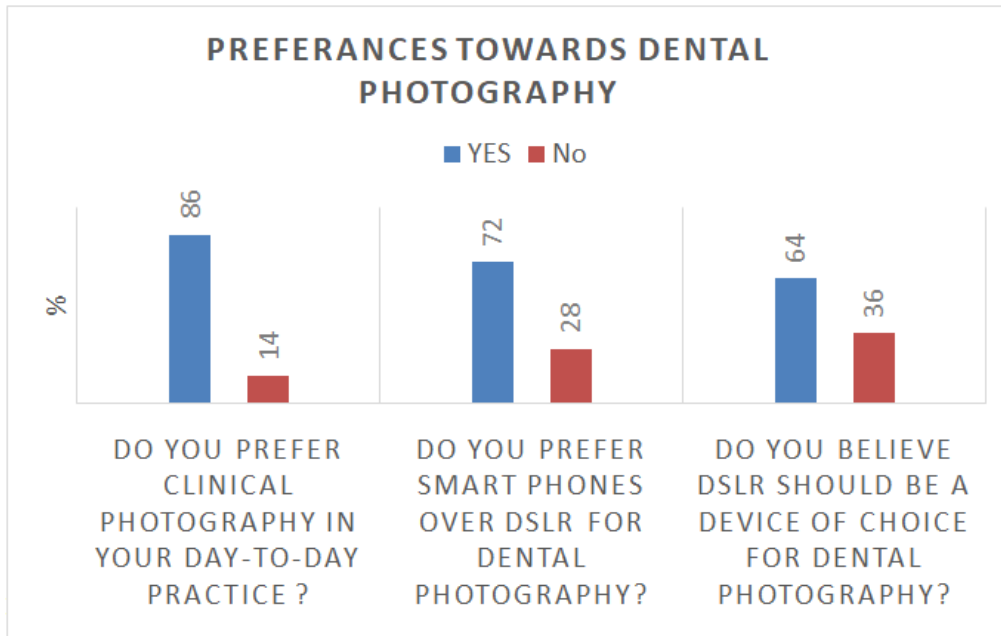
| Age group distribution (in years) | | |
|---|------------|--------------|
| | Frequency | Percent |
| 20 - 30 | 111 | 94.1 |
| 31 - 40 | 5 | 4.2 |
| 41 - 50 | 2 | 1.7 |
| Total | 118 | 100.0 |
| Years of experience distribution | | |
| | Frequency | Percent |
| less than 5 years | 92 | 78.0 |
| 5 to 10 years | 22 | 18.6 |
| more than 10 years | 4 | 3.4 |
| Total | 118 | 100.0 |
| Frequency distribution of dentistry branches among participants | | |
| | Frequency | Percent |
| Endodontics | 16 | 13.6 |
| Oral medicine | 3 | 2.5 |
| Oral surgery | 7 | 5.9 |
| Orthodontics | 7 | 5.9 |
| BDS | 27 | 22.9 |
| paediatric Dentistry | 31 | 26.3 |
| Periodontics | 8 | 6.8 |
| Prosthodontics | 19 | 16.1 |
| Total | 118 | 100.0 |

The majority of study participants expressed a preference for utilizing smartphones in dental photography. However, there is a concurrent belief among them that DSLR cameras should be considered the primary choice for dental imaging. Moreover, their inclinations toward various photographic tools and accessories are also outlined within the study. (Table 2 and Figure 2).

Table 2: Preferences of Dental Professionals towards Dental Photography

| Questions | n = 118 | |
|--|-----------|----------|
| | YES (n) % | NO (n) % |
| Do you prefer smart phones over DSLR for dental photography? | 72% | 28 % |
| Do you believe DSLR should be a device of choice for dental photography? | 64.4% | 35.6% |
| Do you use Macro lens for dental photography? | 28% | 72% |
| Do you use intraoral mirror made of stainless steel over glass for dental photography? | 76.3% | 23.7% |
| Do you use any flash system for dental photography? | 56.8% | 43.2% |
| Do you use contrastors for dental photography? | 48.3% | 51.7% |
| Do you use any editing app for image enhancement? | 54.2% | 45.8% |
| Do you keep a separate drive for your dental photographic data? | 62.7% | 37.3% |

Figure 2: Preferences of Dental Professionals towards Dental Photography

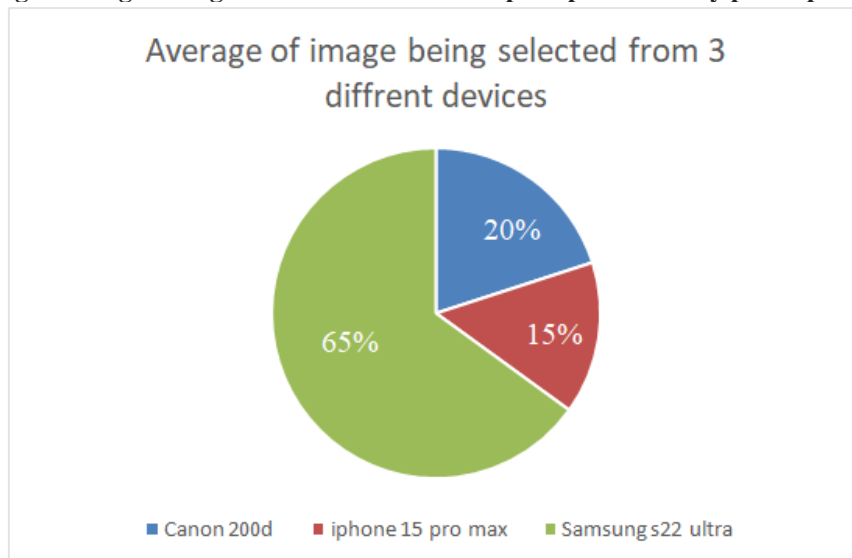


In a Google Form, participants were presented with three images of the same views (Image 1), each captured by a different device: the Canon 200D, iPhone 15 Pro Max, and Samsung S22 Ultra. They were prompted to select the image they perceived as the best. Results indicated that the image taken with the Samsung S22 Ultra was favored, suggesting superior quality according to participants' visual assessments. (Table 3 and Figure 3)

Table 3: Performance of smart phones vs DSLR towards dental photography based on visual perception.

| TYPE OF PHOTOGRAPH | Percentage of the image been selected from a device based on visual perception of participants | | |
|--------------------------------------|--|-------------------|-------------------|
| | CANON 200D | iPhone 15 Pro Max | Samsung S22 Ultra |
| 1. Maxillary arch view | 14.4% | 10.2% | 75.4% |
| 2. Mandibular arch view | 6.8% | 16.9% | 76.3% |
| 3. Front occlusion view | 28% | 22% | 50% |
| 4. Right occlusion view | 16.1% | 10.2% | 73.2% |
| 5. Left occlusion view | 16.9% | 18.2% | 64.4% |
| 6. Extraoral image of denture | 46.6% | 12.7% | 40.7% |
| Extra oral picture of zirconia crown | 12.7% | 14.4% | 72.9% |

Figure 3: Average of images being selected based on visual perception of study participants.



DISCUSSION

In current research, it was revealed that 86 percent of the participants favor utilizing dental photography as an integral part of their daily practice, with a significant majority opting for the convenience of using smartphones for this purpose. Interestingly, the study population exhibits a distinct preference for smartphone cameras over the more traditional approach involving DSLR cameras equipped with macro lenses and flash systems.

In a study conducted by Parikh *et al.* (2018)⁶ concerning the evaluation of knowledge and attitudes regarding clinical photography, findings revealed distinct trends in equipment preferences among participants. Out of the study population, only 28% utilized a macro lens in conjunction with a DSLR camera for clinical dental photography, while a larger proportion, constituting 53%, expressed a preference for using smartphones in this context. Moreover, the present study highlighted that a mere 29% of the population utilized a macro lens for dental photography. Interestingly, a significant majority of 74% within this study cohort favored the use of smartphones for capturing dental images. These findings illuminate prevalent preferences and practices among the surveyed individuals, showcasing a considerable inclination towards smartphone utilization over DSLRs equipped with macro lenses for dental photography. Consequently, there arises a critical need to evaluate the efficacy of smartphone cameras as a viable alternative to DSLRs in the context of dental photography.

Moussa *et al.* (2021)⁷ in their study compared dental photographs taken with DSLR and smartphone cameras alongside digital scans. Findings revealed no significant differences in linear measurements of teeth between DSLR, smartphone (at distances over 24 cm), and scans. Both devices proved reliable for documenting purposes in dentistry, suggesting dentists can utilize DSLR and smartphone cameras (24 cm distance or more) for accurate smile design and measurements. As accuracy remains almost similar, smartphones can be used an alternative for dental photography.

In a survey conducted by Prasad *et al.* (2020)⁸ among orthodontists, preferences were examined concerning intraoral images taken using specific devices, namely Canon 1200D, iPhone 7 Plus, and Oppo R7 Plus. Results revealed distinct inclinations among the orthodontists: 38% favored photos captured with the Canon 1200D DSLR, 34% preferred images from the iPhone 7 Plus, and 28% expressed a preference for photos taken with the Oppo R7 Plus. The present

study highlighted preferences among participants for other devices: a substantial 65% favored images taken with Samsung S22 Ultra, while 20% exhibited a preference for DSLR-captured photos (Canon 200D), and 15% favored images captured using the iPhone 15 Pro Max.

The evolving trend showcased in recent studies underlines a shift in preference towards smartphone cameras over traditional DSLRs equipped with macro lenses for dental photography, emphasizing the need for further exploration and validation of smartphone technology as a reliable tool in the realm of dental imaging and documentation.

CONCLUSION

In conclusion, the current research underscores the evolving trend towards embracing smartphone cameras as a preferred tool for dental photography among practitioners. This shift warrants continued investigation and validation to solidify the role of smartphones as reliable and efficient devices for capturing high-quality dental images and documenting clinical cases in the ever-evolving landscape of dental practice and imaging technology.

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