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Original article

Comparative Evaluation of Dental Imaging Software in Gharyan and Tripoli Dental Clinics

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Abstract
Dental imaging systems are essential tools in modern dentistry, providing accurate diagnostic information and supporting effective treatment planning. In Libya, the availability and performance of these systems vary between regions, creating differences in diagnostic quality and clinical outcomes. This study aims to compare the most commonly used dental imaging devices and software in Gharyan and Tripoli dental clinics—specifically Vatech, Woodpecker, Nanopex, Candy, and V Sensor—by evaluating image quality, usability, reliability, technical support, and overall practitioner satisfaction. A structured questionnaire was distributed to dentists working in public and private clinics in Gharyan and Tripoli. The questionnaire assessed system performance, ease of use, image resolution, affordability, compatibility with clinic infrastructure, and availability of maintenance and technical support. The findings revealed significant differences in the adoption and performance of dental imaging systems between the two cities. Candy35% and Woodpecker25% were the most preferred systems due to their user-friendliness, high-quality imaging, and reliable technical support. In contrast, Nanopex20%, Vatech10% and V Sensor10% received lower satisfaction scores due to limited features and compatibility issues. Overall, practitioner satisfaction was higher in Tripoli, reflecting better access to modern devices and maintenance services. The study highlights the need to standardize dental imaging technologies across Libyan clinics and improve access to high-quality systems, training, and technical support. Enhancing software performance and system integration can significantly improve diagnostic accuracy
and patient care.
Keywords. Dental Imaging Systems, Digital Radiography, Vatech, Woodpecker, Nanopex.

Introduction

Dental image software plays a crucial role in modern dentistry, enabling dental professionals to capture, analyze, and interpret dental images with high precision and efficiency [1-3]. With the advancement of digital technologies, traditional film-based imaging methods have largely been replaced by digital systems that offer a multitude of benefits in terms of image quality, accessibility, and patient care [4-5]. Dental image software is used to process and enhance images from various diagnostic tools, such as digital x-ray, internal cameras, cone beam computed tomography (CBCT), and 3D imaging systems [1]. These software applications are designed to help dentists diagnose dental conditions, plan treatments, and monitor progress over time [6-10]. Dental imaging has become an essential pillar of modern dental practice, offering clinicians detailed visual information that enhances diagnostic accuracy and improves treatment planning [2]. Continuous developments in digital radiography—including intraoral sensors, panoramic imaging systems, and specialized software—have significantly advanced clinical workflows by providing clearer images, lowering radiation exposure, and enabling faster and more efficient data processing. As a result, imaging software now plays a central role not only in routine dental procedures but also in specialized diagnostic and treatment applications [4].

Within Libya, however, the availability and performance of dental imaging systems differ substantially between regions. Factors such as economic disparities, limited access to updated technologies, and inconsistent technical support contribute to noticeable variations in diagnostic capabilities among dental clinics. Despite the growing dependence on digital imaging, there is a scarcity of research evaluating how these systems function in local clinical environments or how practitioners perceive their usability, reliability, and overall effectiveness [11,12]. The present study aims to conduct a comparative evaluation of the most widely used dental imaging software and devices in Gharyan and Tripoli clinics. The objective is to assess key aspects such as image quality, ease of use, system reliability, technical support availability, and practitioner satisfaction. By identifying the strengths and limitations of each system, the study seeks to provide evidence-based insights that can guide clinicians, institutions, and policymakers toward improving imaging standards and enhancing the quality of dental healthcare services across Libya

Methods

Study Design

This study employed a cross-sectional survey-based design to evaluate the most commonly used dental imaging systems in dental clinics in Gharyan and Tripoli. Data collection was conducted over five months, from May to September.

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Sampling Technique
A random sampling technique was used to recruit a total of 100 dentists working in private and public dental clinics in both cities.

Questionnaire Development and Validation
Data were collected using a structured questionnaire designed to assess the usage patterns, efficiency, clarity, ease of use, and language support of various dental imaging systems.
To ensure clarity and reliability, the questionnaire underwent a pilot test involving 10 dentists, after which minor adjustments were made based on their feedback.

Data Collection Procedure
The finalized questionnaire was distributed to participating dentists, who were asked to indicate the systems they use in their daily practice, the origin of the systems, their perceived image quality, usability, and the availability of Arabic language support. The survey also aimed to identify the most widely used systems and the main challenges encountered by users.

Statistical Analysis
Descriptive statistical analysis–including frequencies and percentages–was performed using Microsoft Excel to summarize the responses and compare the different imaging systems.

Results
A total of 100 dentists from Gharyan and Tripoli participated in the study. The analysis revealed that Candy and Woodpecker were the most commonly used dental imaging software among participants, with Candy showing the highest adoption rate, followed by Woodpecker and Vatech, as illustrated in (Figure 1).

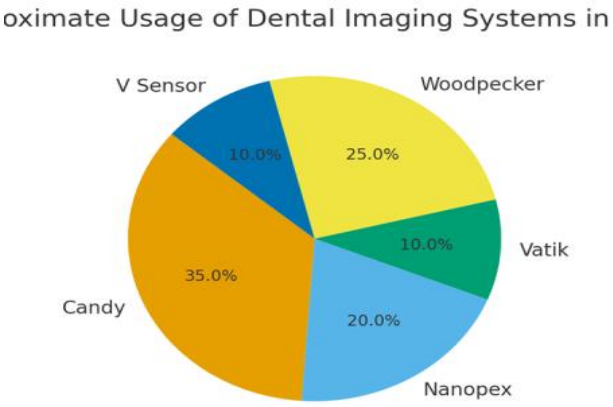

Figure 1. **Distribution of dental imaging software usage among dentists in Gharyan and Tripoli**

Regarding image quality, Vatech and Woodpecker received the highest overall ratings. A large proportion of respondents reported that this software provides superior clarity and diagnostic value compared with other options. Details of image quality ranking are presented in (Figure 2).

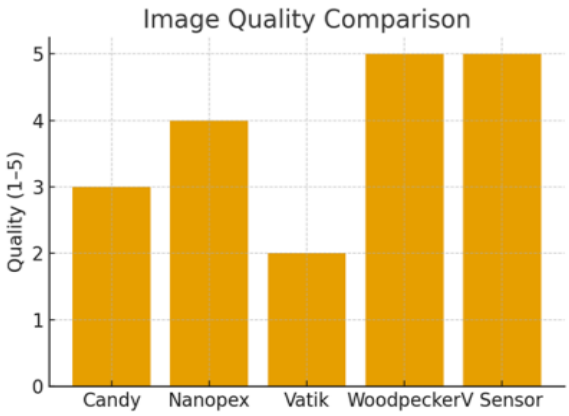

Figure 2. Comparison of perceived image quality across different dental imaging software

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Ease of use was also assessed, and most participants indicated that the software they use is user-friendly and does not require advanced technical skills. Candy, Woodpecker, and Vatech were rated as the easiest to operate, as shown in (Figure 3).

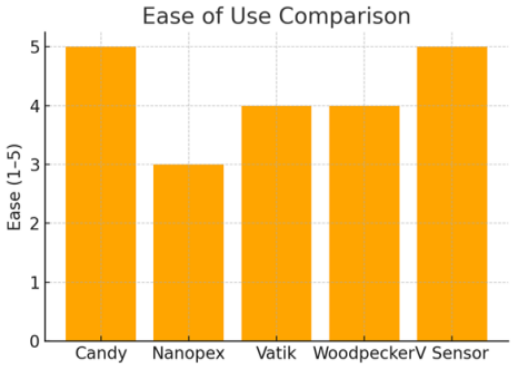

Figure 3. Ease-of-use ratings for different dental imaging software

Language support was a significant factor for many dentists. More than half of the respondents stated that the lack of Arabic language support posed a barrier, particularly among users of imported software. This finding is demonstrated in (Figure 4).

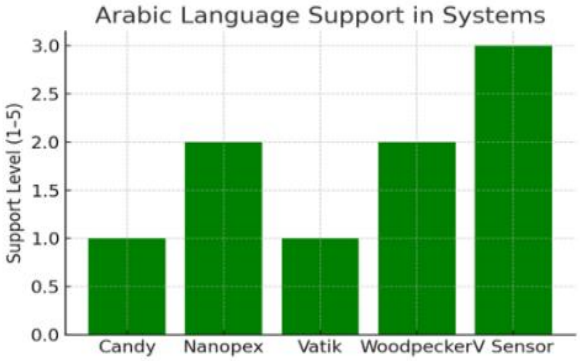

Figure 4. Availability of Arabic language support in dental imaging software

With respect to the frequency of use, most dentists reported relying on their imaging software on a daily or weekly basis for diagnosis, treatment planning, and patient communication. Usage percentages for each software type are summarized in (Figure 5).

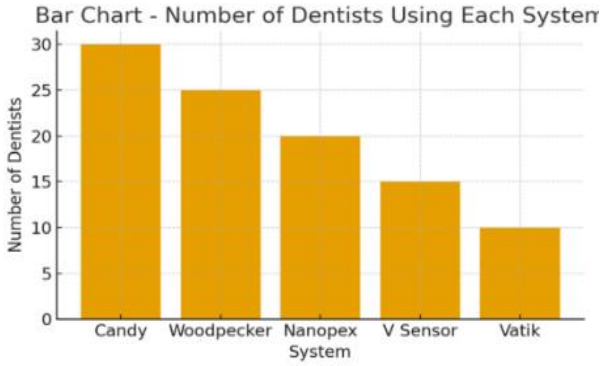

Figure 5. Several dentists are Using Each System

Finally, general adoption trends indicate a growing shift toward modern digital imaging software, with increased demand for higher image quality, better usability, and improved technical support. These trends are reflected clearly in (Figure 6).

The results showed that the majority of doctors rated this system as easy to use, reflecting their suitability for the local clinical environment. Most physicians also considered the image quality to be good to excellent, making these devices sufficient for basic diagnostic purposes. However, two major problems emerged: poor Arabic language support (90% confirmed its almost absence) and insufficient technical support services, which negatively impact continuity and efficiency of use.

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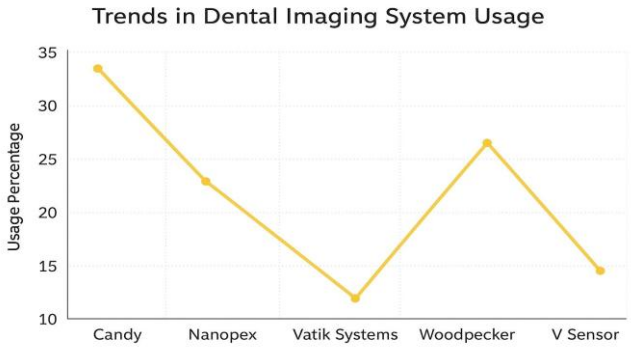

Figure 6. Trends in the adoption of dental imaging software

Discussion

The analysis shows that Candy and Woodpecker are the most commonly used systems due to affordability and ease of use. Nanopex provides good image quality but requires training. V sensor offers the highest image quality but has limited adoption due to the higher cost. Compared to similar challenges in terms of technical support and lack of Arabic language integration [14]. This study's reliance on field surveys strengthens its contribution, as it provides first-hand data. Yet, the findings must be interpreted cautiously due to the small sample size (100 dentists) [17].

The findings of this study highlight the variability in the adoption of dental imaging software and hardware in Libyan clinics, particularly in cities such as Tripoli and Gharyan. The dominance of Candy and Woodpecker software reflects their affordability, ease of use, and availability through local distributors. These findings are consistent with global trends reported by White & Pharoah, who emphasized that cost and accessibility remain decisive factors in developing regions when selecting radio [11].

Comparing the results with international literature, it becomes evident that while Cone Beam Computed Tomography (CBCT) is increasingly becoming the gold standard in implantology and oral surgery [8]. Its full integration in Libyan clinics is still limited due to higher costs and insufficient training. This aligns with the last study, which noted that radiation dose and system price continue to restrict the widespread use of CBCT in small or private Clinics [6]. The survey also revealed that V Sensor provides superior image quality and DICOM compatibility, allowing integration with digital workflows and CAD/CAM systems. However, its uptake in Libya remains relatively low, reflecting the same barrier described by Angelopoulos (2011), who highlighted that advanced digital sensors are often underutilized in low-resource settings [7].

Language barriers also emerged as a significant challenge, as most systems do not support Arabic. This issue creates a gap in usability for some dental practitioners. Similar usability concerns were raised by another study, which emphasized the importance of training and localized support in ensuring proper CBCT utilization [16].

Another important discussion point is the lack of standardized local guidelines for imaging practices in Libya. While the European Academy of Dental and Maxillofacial Radiology (EADMFR) has issued consensus guidelines, Libyan dental clinics lack a comparable reference framework. The development of national or association-level guidelines Libyan Dental Association could ensure safer and more effective use of imaging technology [9]. Finally, this study's reliance on field surveys strengthens its contribution, as it provides firsthand data on the real situation in Libyan dental clinics. Yet, the findings must be interpreted cautiously due to the relatively small sample size (100 dentists). Future studies should expand the sample and include longitudinal monitoring of adoption trends [15].

Conclusion

The analysis shows that the Libyan market features a mix of systems with varying levels of efficiency. Vatech software is limited in uses, mostly in smaller or older clinics, and Nanopex, its usage has recently increased, especially in Tripoli, while Candy and Woodpecker strike the best balance between cost and quality. Finally, the V sensor offers superior image quality but is less widespread due to its higher price. Despite the challenges, improved training and better technical support cloud significantly enhance the efficiency of digital imaging in Libyan dental practice. This study provides valuable insights into the use of dental imaging software and devices in Libyan clinics. It highlights the importance of balancing affordability, image quality, and support when choosing a system. Future efforts should focus on training, Arabic interface support, and better integration with international standards.

Conflict of interest. Nil

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