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Authors' Affiliation:
[1]Assistant Professor and Consultant of Restorative and Digital Dentistry, Restorative Dentistry Department, King Abdul-Aziz University, Faculty of Dentistry, Jeddah, Saudi Arabia.
[2]Assistant Professor and Prosthodontist, Oral Diagnostic Sciences Department, King Abdul-Aziz University, Faculty of Dentistry, Jeddah, Saudi Arabia.

*Corresponding author
Samar H. Abuzinadah; Assistant Professor and Consultant of Restorative and Digital Dentistry, Restorative Dentistry Department, King Abdul-Aziz University, Faculty of Dentistry, Jeddah, Saudi Arabia.
sabuzinadah1@kau.edu.sa

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The prevalence and consciousness of using magnification devices during the restorative procedures among the dental practitioners in Saudi Arabia

Samar H. Abuzinadah[1]*, Osamah Alsulimani[2]

ABSTRACT

Background: Magnifying loupes in dentistry have three key objectives: To improve visibility, compensate for the lack of near vision presbyopia and maintain proper posture. The study aims to determine the prevalence and consciousness of using magnification devices during restorative procedures among dental practitioners in Saudi Arabia. *Methods:* The study group included all dental practitioners aged above 18 years. The outcomes of this study were analyzed using the SPSS program using a pre-tested questionnaire. *Results:* The study included 634 participants as follows; 56.9% females; 43.1% males; 46% dental interns; 35.8% General Dentists; 47.9% from the western region; 33.9% from the Central region. 55.7% of participants were using magnification devices and 44.3% were not using magnification devices. 32 percent of respondents thought that the expensive price of the magnification equipment was a barrier to its use. In comparison, 27.1% found no reason to hold back from buying the magnifying loupes. The rest of the participants found excuses for not buying; 17.1% chose discomfort; 16.1% chose lack of training; 7.7 of Dental practitioners decided to wear glasses. *Conclusion:* The findings revealed that, while most practitioners were aware of dental magnification, their use in clinical practice could have been better. Dental practitioners have moderate knowledge of the usage of dental magnification during restorative procedures.

Keywords: Magnification devices, Magnifying loupes, Restorative procedures, Dental practitioners, Prevalence, Consciousness.

1. INTRODUCTION

Magnification devices, such as dental loupes and microscopes, have grown in importance as tools in dentistry during the past few decades. Utilizing optical magnification with appropriate lighting is safe and valuable to enhance the

success of challenging esthetic restorative and endodontic operations (Braga et al., 2021). Dentists frequently use magnifying loupes for clinical practice and dental students are increasingly seen wearing them while learning (Eichenberger et al., 2011). Before advising the widespread use of loupes in training, however, clinicians must address concerns about potential hazards to the eye when worn over a short term and when a practitioner is actively practicing. It takes time to use loupes, which can be challenging for some practitioners (James and Gilmour, 2010).

There are several different magnification technologies available to dentists nowadays. These magnifying devices include a wide range of clinical microscopes, basic loupes and compound prism telescoping loupes (Šošić et al., 2021). Each magnification method has distinct benefits as well as drawbacks. These loupes are essentially constructed of 2 monocular microscopes with a lens system arranged, paired together and slanted to concentrate on a single object (Naik et al., 2015). Following prior research by Burton and Bridgman, (1990) which aims to assess the prevalence of used magnifying glasses in New Zealand, the study showed that 18 percent of New Zealand's general dentists attended to used magnifying glasses.

Although specialists in restorative and endodontic dentistry utilize powerful loupes and microscopes, it is crucial to promote magnifying loupes among all dental practitioners to improve their clinical outcomes and posture (Selden, 2002). Magnification tools have been used in dentistry for several reasons, including better treatment results, enhanced eyesight and improved job quality. Another major worry is the high rate of musculoskeletal injuries among dental practitioners (Eichenberger et al., 2015). Magnification also becomes necessary when using the International-Caries-Detection and Assessment-System (ICDAS) ocular inspection protocols (Pitts and Ekstrand, 2013).

The visual field is enhanced if the dentist uses magnification loupes, microscopes or video electronics such as a close-up camera system. The chances of caries/disease quality and concomitant restorations will also be improved. Studies have shown reduced errors in dental procedures with magnification use (Leknius and Geissberger, 1995; Zaugg et al., 2004). Few studies have been conducted to determine the prevalence of the usage of magnification devices among dental practitioners; previous research was done in a specific area in Saudi Arabia. Therefore, further research, including different locations, is needed. The study aims to determine the prevalence, awareness and attitude of using magnification devices among dental practitioners in Saudi Arabia.

2. METHODS

Study design

This cross-sectional study uses a self-administered online questionnaire conducted among dental practitioners in Saudi Arabia between November 2021 and July 2022. The study's population includes consultants, specialists, residents, General dentists and dental interns living in the Kingdom of Saudi Arabia.

Sample size

The sample size was estimated using the Rao-soft calculator with a confidence level of 95%, the maximum acceptable error is 0.05, and the calculated minimum sample size was 384 for valuable information. Data was collected from the participant's responses to the questions.

Inclusion and Exclusion criteria

This study included all dental consultants, specialists, residents, general dentists and dental interns who live in Saudi Arabia and fully completed the survey. This study excluded all dental students and the dental practitioners who did agree to participate in our research.

Method for data collection

A self-administered, anonymous English questionnaire was provided to every volunteer for this study. Demographic information was gathered for the study and the prevalence and consciousness of using the magnification devices and type of dental loupes were determined.

Data analysis

The data were verified and coded to be entered into a personal computer. Data were analyzed by the Statistical Package for Social Sciences (IBM, SPSS version 27). Descriptive statistics (i.e., frequency, percentage, mean and standard deviation) were calculated. P-values less than 0.05 were considered statistically significant.

3. RESULTS

Table 1 shows the socio-demographic characteristics of participants. The study included 634 participants as follows; 56.9% were females; 43.1% were males; 34.8% were between 25- 30 years old; 5.5% were between 51-60 years old; 92.9% were Saudi; 46% dental interns; 35.8% were general dentists; 47.9% from the western region; 33.9% from the central area (Figure 1). As in Figure 1, most of the participants from western region 48% and only 4.2% Southern region.

Table 1 Socio-demographic characteristics of participants (n=634)

Parameters		No.	Percent
Gender	Male	273	43.1
	Female	361	56.9
	Total	634	100
Age	25 - 30 years old	339	53.5
	31 - 40 years old	218	34.4
	41 - 50 years old	52	8.2
	51 – 60 years old	25	3.9
	Total	634	100
Region	Southern region	26	4.2
	Eastern region	52	8.2
	Northern region	37	5.8
	Western region	304	47.9
	Central region	215	33.9
	Total	634	100
Education level	Consultant	14	2.2
	Specialist	45	7.2
	Resident	56	8.8
	General Dentist	227	35.8
	Dental intern	292	46
	Total	634	100
Nationality	Saudi	589	92.9
	Non-Saudi	45	7.1
	Total	634	100

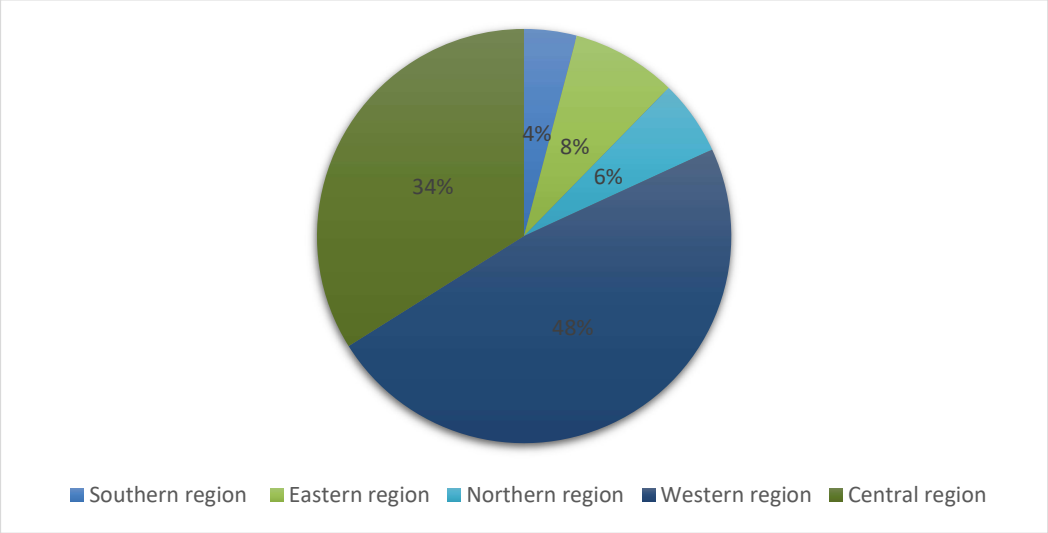

Figure 1 The participants' distribution in Saudi Arabia

Table 2 illustrates the consciousness of magnification device usage among participants and the type of magnification device. The prevalence of using the magnification device among the participants was 55.7% not using while 44.3% were using magnification devices (Figure 2). Only 1.1% use magnifying glasses, while 44.5% use dental optical loupes 3x magnification devices. A percentage of 43 among the sample size state that utilizing the magnification device depends on the case itself. A rate of 47 believed that magnification devices were effective for all dental specialties. As in Figure 2, 44% of the participants using the magnification devices among dental practitioners.

Table 2 The consciousness of the usage of magnification devices among participants, the type of magnification devices, attitude and awareness (n=634)

Variables	No.	Percent
Do you use magnification during the dental process?		
Yes	281	44.3
No	353	55.7
If yes, what type of magnification devices do you use?		
Dental optical loupes 2.5x	78	27.7
Dental optical loupes 3x	125	44.5
Dental optical loupes 3.5x	33	11.7
Dental optical loupes >3.5x	29	10.4
Magnifying glasses	3	1.1
Microscope	5	1.8
Dental loupes + Microscope	8	2.8
What would you do if you had to work on a patient today but didn't have your magnifying device?		
I will work without magnification devices	62	22.1
I'll reschedule the appointment time	98	34.9
I may or may not treat the patient, depending on the case	121	43
Do you think dental magnifying could improve the quality and accuracy of your work?		
Yes	509	80.3
No	125	19.7
What do you think about the effectiveness of using dental magnification based on dental specialties?		
Diagnosis	12	1.9
Endodontic treatment	68	10.7
Operative treatment	115	18.1
Prosthodontic treatment	80	12.6
Periodontal treatment	8	1.3
Surgical treatment	11	1.7
Orthodontic treatment	3	0.5
All of the above	298	47
Not add any value	39	6.2
The Advantage of using a magnification device		
Improve the quality and accuracy of treatment procedures	24	3.7
Reduced eye strain	47	7.4
Reduced chronic back and shoulder pain	18	2.8
All of the above	545	86.1
Source of magnification devices knowledge		
Workshops	88	13.8
University	189	29.7

Demonstrations	114	18.1
Social media	97	15.4
Colleagues	146	23

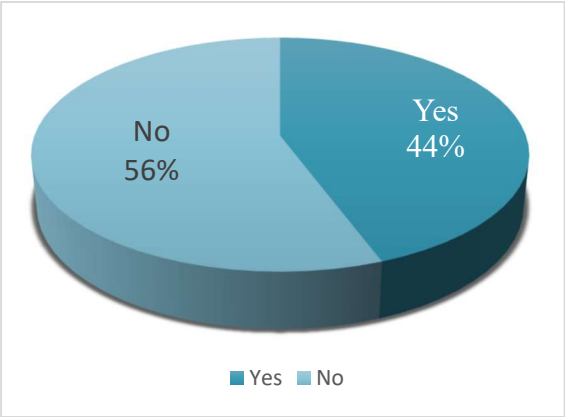

Figure 2 The prevalence of usage of magnification devices among dental practitioners in Saudi Arabia

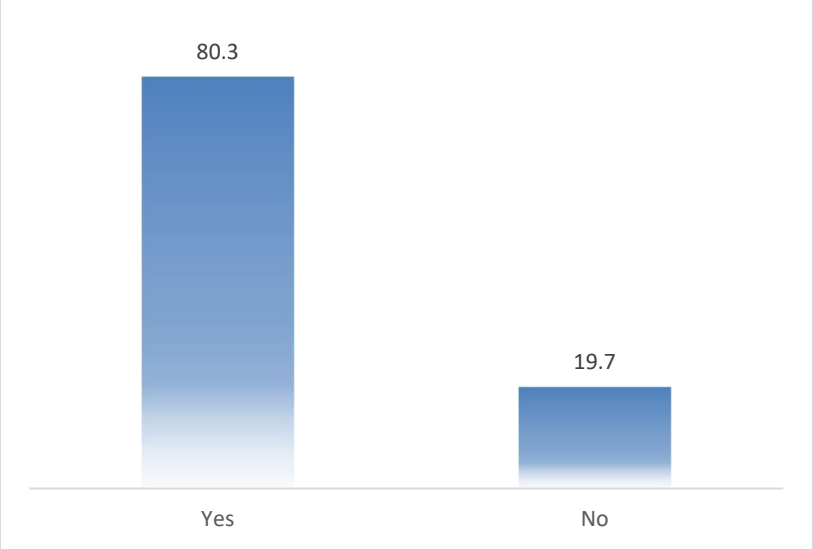

Figure 3 Do you think dental magnifying could improve the quality and accuracy of your work?

Table 3 shows the dental practitioners' reasons for not using magnification devices; 32% of the participants agreed that the limitation behind not using the magnification device was due to its high cost; 17.1% stated that the discomfort of using the magnification device is the reason of its disuse; 16.1% admit that lack of training is the reason of not using the magnification device. On the other hand, 27.1% have no reason not to use it, while the remaining 7% stated wearing eyeglasses as a reason.

Table 3 Dental practitioners' reasons for not using magnification devices (n=634)

Parameter		No.	Percent
Reason for not using a magnification device	Discomfort	108	17.1
	Cost	203	32
	Wearing glasses	49	7.7
	lack of training	102	16.1
	I don't know	172	27.1

4. DISCUSSION

Endodontists were the first practitioners of the dental profession to recognize the practical uses of surgical microscopes in both conventional and surgical endodontics (Carr and Murgel, 2010). Little research has been published in Saudi Arabia on dental magnification usage among different dental specialties. Less than we had anticipated, dental practitioners in KSA used magnification regularly. This study was conducted to determine the prevalence of the usage of magnification devices among dental practitioners in Saudi Arabia.

In general, exact data on the prevalence of the usage of magnification devices among dental practitioners are scarce. Alhazzazi et al., (2016) conducted a study at King Abdulaziz University, Faculty of Dentistry, which stated that only 21.4% of participants in the study utilized dental magnifiers while 78.6% never used the dental magnification device throughout their careers. Our study indicated an improvement in the practitioner's consciousness regarding the magnification device, where 44.3 % of participants used the magnification devices. Moreover, the authors found that magnification loop size x3.0 would be most beneficial in Operative dentistry followed by prosthetic dentistry, which conflicts with what Forgie et al., (1999) have stated in Scotland, that this magnification size is more of assistance in dental prosthetic procedures than others.

In this study, only 1.1% used magnifying glasses and 44.5% used Dental optical loupes size 3x magnification. A study in India showed that 8.6% of the participants who used loupes in the past had done so at 2.5x to 3.5x magnification and 14.1% had done so at x3.5 to 4x magnification; 7.3% of the participants who wanted to upgrade to surgical microscopes used 2x to 10x magnification loupes and 1.4% used 10x to 20x magnification loupes; 17% of whom used loupes, chose to use a headlight when operating and 22% felt the need for using a headlight when it comes to the operator's comfort level (Penmetsa et al., 2017).

Most of the participants in this study were dental interns who showed good knowledge of the magnifying gadgets. Most participants learned about dental magnification via university (29.7%), followed by recommendations from their colleagues (23%). These findings aligned with a study among Swiss dental practitioners by Eichenberger et al., (2015), which found that colleagues had the most significant influence on purchasing magnification aids (34%). However, Hagge, (2003) found that 16% started using magnification devices after educational courses, 11% bought them through exhibitions and 38% from reading scientific articles (38%).

According to Gorter et al., (2000), three out of ten dentists have poor physical health and one out of ten have poor general health. These issues can be avoided by raising knowledge of ergonomics during dental procedures (Sarkar and Shigli, 2012; Sood et al., 2016). For more accurate, practical and enjoyable dental work, all dentists should consider using the appropriate visual magnification because this could reduce the chance of musculoskeletal injuries due to better vision and supported back posture (Christensen, 2003; Friedman, 2004). Additionally, teaching students how to use magnifying loupes early in dental education programs may significantly enhance their posture while receiving dental treatment (Maillet et al., 2008). Unfortunately, using dental magnifying instruments is not explicitly taught in Saudi Arabia. However, this idea is promoted during the academic year through continuing education classes.

5. CONCLUSION

In an institution where the use of magnified vision systems is optional, the prevalence and consciousness of usage of the magnification equipment were investigated among dental practitioners. Results showed that although most practitioners were aware of dental magnification, their use in clinical practice was disappointingly less than expected. Dental practitioners have moderate knowledge of the usage of dental magnification. To expand the use of dental magnification systems during dental treatments, dental practitioners require more training and must continue education on the importance of using the magnification device system throughout their carrier. Future studies with larger sample sizes are necessary to identify the point of improvement needed to improve the consciousness of dental practitioners among all specialties and enlarge the scale of using this tool as an essential operational tool for an accurate outcome.

Recommendation

The recommendation of this study summarized the importance of raising the awareness of all dental practitioners' specialties, specifically esthetic Prosthodontics and Operative dentistry, to use the magnification device to enhance the accuracy of the operational procedures, improve the overall quality of their work and maintain the longevity of their career.

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Author Contributions

The authors confirm contribution to the paper as follows: Study conception and design: Samar H Abuzinadah and Osamah Alsulimani; draft manuscript preparation: Samar H Abuzinadah and Osamah Alsulimani. All authors reviewed the results and approved the final version of the manuscript.

Ethics statement

Ethical approval was obtained from the Research Ethical Committee at the Faculty of Dentistry at King Abdulaziz University # 158-12-22. Participants were informed that their participation was voluntary and filling out the questionnaire indicated their consent to participate.

Informed consent

Written informed consent was obtained from all individual participants included in the study.

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Conflict of interest

The authors declare that there is no conflict of interests.

Data and materials availability

All data sets collected during this study are available upon reasonable request from the corresponding author.

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