

**AWARENESS, ATTITUDE, AND PRACTICE TOWARD USING DENTAL  
MAGNIFICATION AMONG DENTAL STUDENTS AND PRACTITIONERS IN SAUDI  
ARABIA: A CROSS-SECTIONAL STUDY.**

**Abdulrahman J. Alhaddad<sup>1</sup>, Raghad M. Althobaiti<sup>2</sup>, Fai S. Alsuwayhiri<sup>2</sup>, Ghadeer M. Albaqami<sup>2</sup>, Lina A. Alqourashi<sup>2</sup>, Ghufran M. Aljohani<sup>2</sup>, Emtinan A. Alamoudi<sup>2</sup>, Alhassan A. Etirji<sup>3</sup>, Khames T. Alzahrani<sup>4</sup>.**

<sup>1</sup>Associate Professor and Consultant of Prosthodontics, Oral and Maxillofacial Prosthodontics Department, King Abdulaziz University, Faculty of Dentistry, Jeddah, Saudi Arabia.

<sup>2</sup>Dental student, Umm Al-Qura University, Makkah, Saudi Arabia.

<sup>3</sup>Dentist, Vision Colleges, Jeddah, Saudi Arabia.

<sup>4</sup>BDS, PGD Endo from Stanford University, Saudi Board of Endodontic SR, King Faisal Specialist Hospital & Research Centre, Riyadh, Saudi Arabia.

**\*Corresponding author:** Raghad M. Althobaiti; **Email:** ra.malthobaiti@gmail.com

**Abstract**

**Introduction:** Magnification loupes are among the most innovative devices used in dentistry to enhance the quality of work during dental procedures. They improve visual acuity and the dentist's posture, yet few studies have examined users' perceptions of their adaptability. This study aimed to determine the awareness, attitudes, and practices of dental students and practitioners regarding the use of dental magnification loupes. **Method:** This is cross-sectional study in Saudi Arabia using a structured questionnaire. A sample size calculator estimated a minimum sample size of 385 participants. The study focused on dental students, interns, and practitioners in Saudi Arabia. We administered a questionnaire to 20 participants to assess its feasibility and usability. The study evaluated participants' awareness, attitudes, and practices using 26 statements. Correct responses received one point, while incorrect responses received zero points. Likert scales were used, with a maximum score of 19, and participants were divided into two groups based on their scores. Awareness scores ranged from 0 to 8, attitude scores ranged from 0 to 5, and practice scores ranged from 0 to 6. **Results:** The study assessed the awareness, attitudes, and practices regarding dental magnification loupes among 483 dental students and practitioners in Saudi Arabia. There were big differences in how easy it was to get dental education depending on where you lived. Also, a lot of people (64%) said they were confident enough to do treatments without using magnifying tools. Despite 94.2% recognizing the benefits of magnification, 58.2% reported not using loupes, primarily due to perceived costs and discomfort. Awareness levels were low, with only 35.8% demonstrating high awareness of loupes. The findings highlight a critical gap in education and training, suggesting a need for enhanced awareness and utilization of magnification loupes in dental practice. **Conclusion:** This study highlights a significant gap between awareness and the practical application of dental magnification loupes among dental students and practitioners in Saudi

Arabia. Despite the well-known benefits of magnification, obstacles like cost, discomfort, and insufficient educational opportunities impede their widespread adoption.

**Keywords:** Magnification, awareness, practice, loupes.

### **Introduction:**

When studying, teaching, and treating patients with microanatomy structures, narrower canals, and instrument retrieval, magnification is critical [1]. There is increasing evidence that using magnification enhances visual acuity, the dentist's posture, and the quality of dental procedures [2]. Recent research also shows that using loupes and a dental operating microscope (DOM) can enhance clinical outcomes [3].

Its development in dentistry over the past fifteen years, especially in endodontics, has completely transformed the practice of endodontics worldwide [4]. Operative magnifying loupes have been presented as an essential component of dental equipment since the 1990s [5]. This indicates that both dental professionals and students are increasingly interested in and using loupes [6]. We have introduced original designs that vary in form (Keplerian or Galilean) and magnification volume (from 2 to above 6). According to a 2016 study, 69.7% of respondents (n = 454) completed the survey. Of those, 78.1% performed dental procedures without the use of magnification. Nonetheless, 81.8% of respondents believed that dental magnification could improve the precision and quality of their dental treatment. Additionally, 91.6% of respondents believed it would be helpful in endodontics, while 46.3% supported its use in surgery. The majority of those who used magnification (21.9%) or 55.9% used dental loupes. The majority of participants (59.4%) thought that faculty members should start employing dental magnification in Year I of dental school [8]. A study published in 2022 found that 69 (82.1%) of the participants utilized dental magnification during any dental procedure, indicating that students generally have an awareness of and attitude toward its use. Sixty-one (72.6%) of the participants felt that the magnification system was complementary, whereas 66 (78.0%) had been using it for less than a year. More than half of the respondents, or 59.5%, thought that dental magnification could improve the overall quality and accuracy of their work [9].

A study conducted in 2018 found that the majority of respondents were aware of dental magnification (91.1%) and the various kinds of magnifying equipment available (90.5%). However, when asked why they did not use magnifying glasses, 32.7% said it was because they had never used them, and 32.4% said it was because they were too expensive. Furthermore, when considering gadget usage, only 23.8% of all participants used magnifying glasses [10]. There are limited articles evaluating Saudi Arabians' knowledge and attitudes toward the use of magnifying loupes. The high awareness among respondents regarding dental magnification and the types of available equipment highlights a significant gap between knowledge and actual usage. It is concerning that nearly one-third of participants cited a lack of experience or cost as barriers to utilizing magnifying glasses. This low adoption rate, with only 23.8% actively using such tools, suggests a need for further education and potentially financial support to encourage their use. Additionally, the scarcity of literature focusing on the perceptions of Saudi

Arabians regarding magnifying loupes underscores an opportunity for future research in this area. The disparity between knowledge and practical application is noteworthy. Alarmingly, approximately one-third of the participants identified insufficient experience or financial constraints as obstacles to the utilization of magnifying glasses. The adoption rate, which stands at a mere 23.8% for active users of these tools, highlights the necessity for enhanced educational initiatives and possible financial assistance to promote their usage. Also, there isn't a lot of academic literature about how Saudi Arabians feel about magnifying glasses. This means that there is a big chance for more research to be done in this area. About one-third of the participants cited a lack of experience or financial limitations as barriers to using magnifying glasses. With only 23.8% of individuals actively using these tools, it is clear that there is a need for improved educational programs and potential financial support to encourage their adoption. Additionally, the scarcity of research on how Saudi Arabians view magnifying loupes indicates a valuable area for future studies.

**Objectives:**

The purpose of this study is to determine awareness, attitude, and practice regarding the use of dental magnification loupes. Among dental students and practitioners.

**Methodology:****Study Design and Setting:**

Saudi Arabia conducted this cross-sectional study from July 2024 to December 2024. Previous studies developed a structured questionnaire, which served as the basis for this study.

**Sample size:**

The sample size calculator was used to estimate the sample size with an expected prevalence of 50%, a confidence level of 95%, and a maximum acceptable marginal error of 5%. As a result, the minimum sample size is 385 participants.

**Inclusion and Exclusion Criteria:**

This study includes dental students, dental interns, and dental practitioners who live in Saudi Arabia. This study excludes students or practitioners of other health specialties or those who live outside Saudi Arabia.

**Method for data collection, instrument (*data collection technique and tools*):**

We provided a self-administered, anonymous questionnaire in both Arabic and English to all dental practitioners and students in Saudi Arabia. A data collection tool was prepared from a literature survey: <8, 9, 11>. The survey consisted of three sections and twenty-three questions. Section 1 begins with a brief description of the research objective and the consent question. Demographic details, including gender and level of education, are included in Section 2. In Section 3, participants were asked about their awareness and attitudes regarding the use of magnification devices, types of magnification devices,

advantages of using magnification loupes, and practices related to magnification loupes. We also questioned them about their attendance in courses on the use of magnification in the dental field.

**Scoring system:**

We used a total of twenty-seven statements to assess the participants' awareness, level of attitudes, and practice. We used 4 statements for demographics, 8 for practice, 8 for awareness, and 7 for attitude. Correct responses receive one point, while incorrect responses receive zero points. For scoring, we utilized Likert scales (dichotomous, three-point, and quality scales). We divided the maximum score (19) as follows: The original Bloom's cutoff points are 80.0%-100.0%, 60.0%-79%, and 59.0%. Based on their scores, we will divide the participants into two groups. Awareness scores varied from 0 to 8 points and were classified into two levels as follows: those with a score of 5 or below ( $\leq 5$ ) were classified as having a **low level of awareness**, and those with scores of 6 or above ( $\geq 6$ ) as having a **high level of awareness**.

Attitude scores varied from 0 to 5 points and were classified into two levels as follows: those with a score of 3 or below ( $\leq 3$ ) were classified as having a **low level of attitude**, and those with scores of 4 or above ( $\geq 4$ ) as having a **high level of attitude**.

Practice scores varied from 0 to 6 points and were classified into two levels as follows: those with a score of 4 or below ( $\leq 4$ ) were classified as having a **low level of practice**, and those with scores of 5 or above ( $\geq 5$ ) as having a **high level of practice**.

**Pilot test:**

We gave a questionnaire to each of the 20 participants and asked them to fill it out. We conducted this to assess the study's feasibility and the usability of the questionnaire. The analysis of the study did not incorporate the findings from the pilot study.

**Analyzes an entry method:**

We entered the collected data into a Microsoft Excel (2016) Windows application. The data underwent statistical examination using the statistical package for social science software, version 20. Participants were categorized based on their scores, distinguishing between those with a low level of practice (scores of 4 or below) and those with a high level of practice (scores of 5 or above).

**Results:**

Table (1) displays various demographic parameters of the participants with a total number of (483). The data show pronounced regional (Central [32.7%] and Western [35.8%]), suggesting regional discrepancies in the access to dental education or practice. The data is inclusive as females and males are represented equally, with 53.2% of females and 46.8% of males. Additionally, participants vary in their educational levels ranging from dental practitioners (27.3%) and many students in their final years — sixth year (23.2%) and fourth year (21.9%).

**Table (1): Sociodemographic characteristics of participants (n=483)**

<i>Parameter</i>		<i>No.</i>	<i>Percent (%)</i>
<i>Region of residence</i>	Northern region	20	4.1
	Southern region	85	17.6
	Central region	158	32.7
	Eastern region	47	9.7
	Western region	173	35.8
<i>Gender</i>	Female	257	53.2
	Male	226	46.8
<i>Which level of education are you currently?</i>	Dental practitioner	132	27.3
	Third year	36	7.5
	Fourth year	106	21.9
	Fifth year	50	10.4
	Sixth year	112	23.2
	Internship	47	9.7

As shown in figure 1, The information reflects the answers of a full sample of 483 individuals to their decisions when faced with the lack of a magnifying tool needed for patient care. Significantly, 64 percent (307 respondents) would continue treatment of the patient if they did not have the tool present, indicative of very high confidence that they would be able to perform the procedure without it. However, 27% (131 respondents) also pointed to how their decision would depend on the specific procedure that was being proposed, indicating a more nuanced approach to patient care considering the context. In addition, nine percent (45 participants) said they would reschedule the patient due to safety concerns and because they feel comfortable when they are in clinical practice.

**Figure (1): Illustrates the dentist’s reaction in the absence of magnifying tool when working on a patient.**

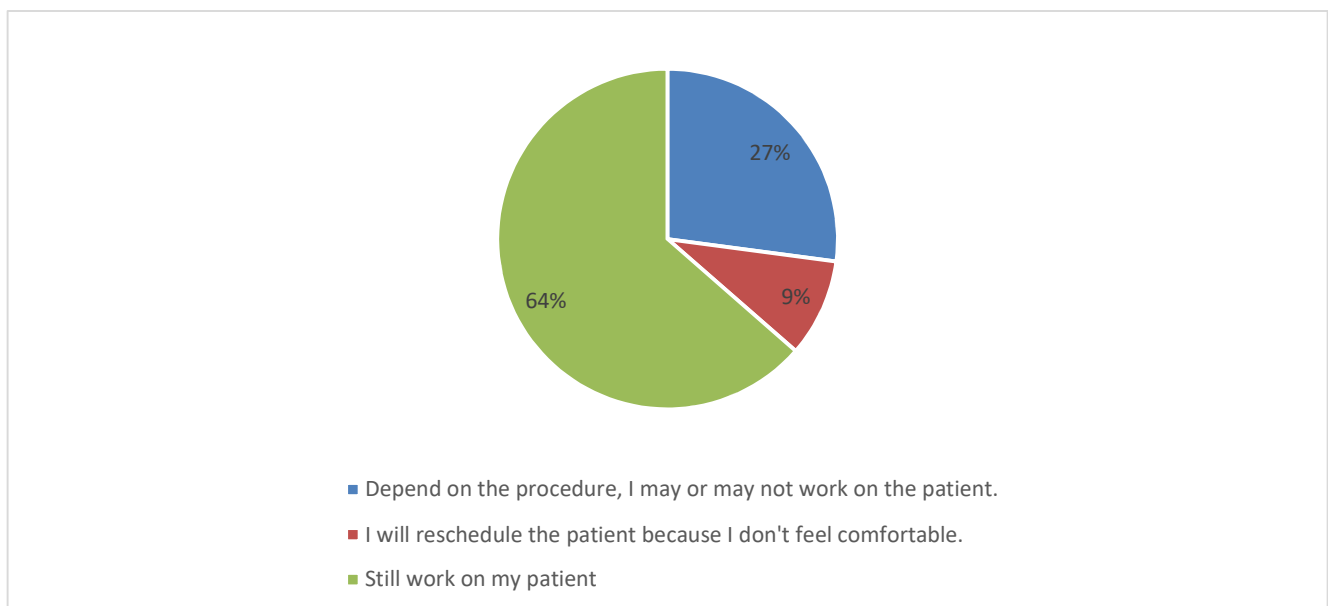


Table 2 presents the data which can serve as a useful source of information about the attitudes of dental professionals toward the use of magnification loupes in clinical practice. Notably, the majority, significantly so (58.2%), of respondents do not currently use magnification during procedures. Of the magnifiers employed by this subgroup, loupes are preferred 80%. Overall use duration is relatively short, with most (52.4%) having fewer than a year experience using these tools, and our interviewee subject matter experts indicated that many practitioners are still in the process of adapting to these tools. Interestingly, a whopping 94.2 percent of volunteers believe that magnification increases the accuracy and quality of their work, indicating a very strong perceived value for these devices. But a large 61.9% view magnification systems as complimentary rather than mandatory, indicating a widespread view that the technology should be accepted for use in everyday dental practice. In addition, the high number of respondents (69.4%) who do not attend workshops or courses on magnification presents an opportunity to provide additional educational opportunities to increase the use of magnification in dentistry.

**Table (2): Parameters related to attitude toward using dental magnification loupes (n=483).**

<i>Parameter</i>	<i>No.</i>	<i>Percent (%)</i>
<i>Do you use magnification during dental procedure?</i>	No	281 58.2
	Yes	202 41.8
<i>If yes, what type of magnification device used? (n=235)</i>	Dental operating microscope	47 20.0
	Loupes	188 80.0
<i>Time of using magnifying systems (n=252)</i>	Less than one year	132 52.4
	More than five years	22 8.7
	One to five years	100 39.7
<i>What would you do if you needed to work on a patient today but didn't have your magnifying tool with you?</i>	Depend on the procedure, I may or may not work on the patient.	131 27.1
	I will reschedule the patient because I don't feel comfortable.	45 9.3
	Still work on my patient	307 63.6
<i>Do you believe magnification systems should be mandatory or complementary?</i>	Complementary	299 61.9
	Mandatory	184 38.1
<i>Do you believe that dental magnification can improve the accuracy and quality of your work?</i>	No	28 5.8
	Yes	455 94.2
	No	335 69.4

<i>Have you attended any workshops or courses on the use of magnification in dentistry?</i>	Yes	148	30.6
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As shown in figure (2), This data, presented, is a figure derived from a survey done of a sample of 483 people about whether they are aware of the magnification levels amenable from the magnification loupes. In its communication regarding the optical tool, a very high number, 55.6 per cent (268 out of 483 respondents) confirmed that they were aware of the instrument’s capacities. Somewhat to the contrary, 44.4 percent (215 respondents) said they did not realize the magnification could be anything other than with such loupes.

**Figure (2): Illustrates dentists’ awareness of achievable magnification loupes.**

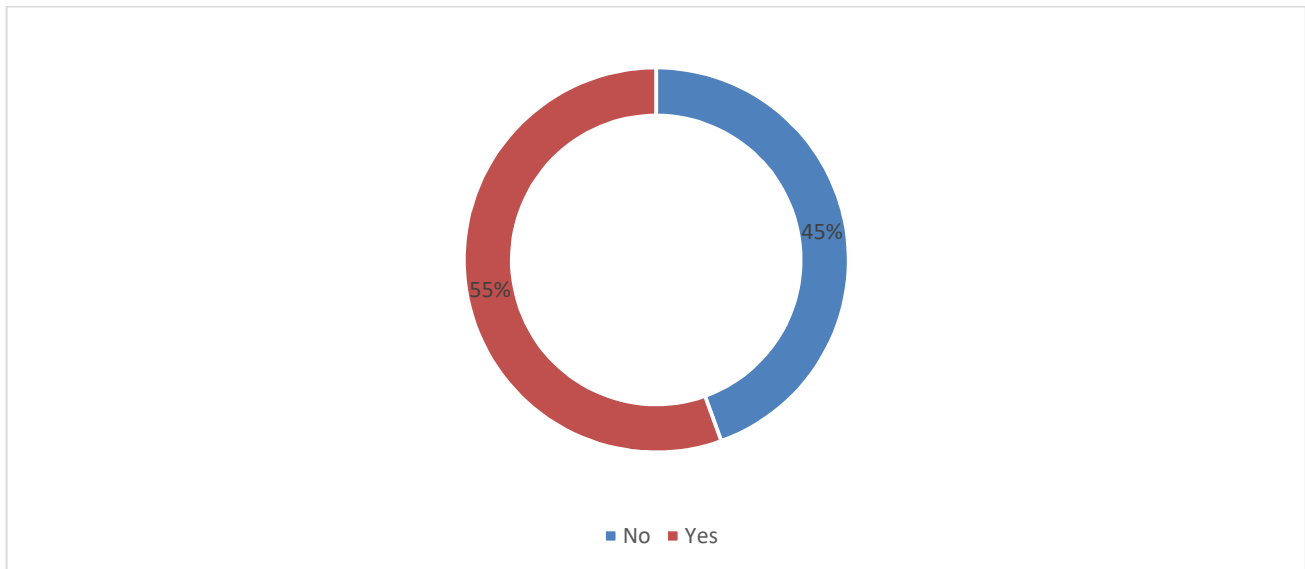


Table 3 represents the awareness of the participants on utilization of the dental magnification loupes their benefits and drawbacks. An impressive majority reported familiarity with the benefits (83.9%) of these devices with favoured benefits including increased treatment accuracy (34.5%) and improved operator ergonomics (30.4%). Notably, more than half of respondents agreed that these loupes would save time and help increase treatment quality. On the other hand, nearly half (47.8%) also reported knowledge of the possible disadvantages of shopping at that price, such as the high initial cost (57.4%), experience with additional practice (41.7%), or procrastination (24.6%). Additionally, the numbers show disconcerting ignorance regarding types of loupes, 66.5% and 69.2% of respondents stating they were unfamiliar with Flip up and through the lens styles of loupes respectively.

**Table (3): participants' awareness toward using dental magnification loupes (n=483).**

<b>Parameter</b>		<b>No.</b>	<b>Percent (%)</b>
<b>Do you know the advantages of utilizing magnification loupes in dentistry?</b>	No	78	16.1
	Yes	405	83.9
<b>Advantages of utilising magnification loupes in dentistry * (n=461)</b>	Save time	131	28.4
	Help with maintaining the posture of the operator (ergonomics)-	140	30.4
	Improve the accuracy of treatment-	159	34.5
	Improve the quality of treatment-	137	29.7
	Reduce visual stress-	95	20.6
	All the above	259	56.2
	<b>Do you know the disadvantages of utilizing magnification loupes in dentistry?</b>	No	176
Yes		307	63.6
<b>Disadvantages of using magnification loupes in dentistry? *(n=441)</b>	Neck pain	87	19.7
	Initial high cost	253	57.4
	More practice needed	184	41.7
	All the above	146	33.1
<b>Are you aware of flip-up of magnification loupes?</b>	No	321	66.5
	Yes	162	33.5
<b>Are you aware of through-the-lens (TTL) magnification loupes?</b>	No	334	69.2
	Yes	149	30.8
<b>Are you aware of the magnification level achievable with magnification loupes?</b>	No	215	44.5
	Yes	268	55.5
<b>Dental magnification has a positive impact in the long run</b>	No	64	13.3
	Yes	419	86.7

**\*Results may overlap**

Table 4 presents the data which are useful to understand the prevalence and problems of the dental magnification loupes use during dentist and dental students. Of particular note was a substantial share of participants (46.6%) who reported that they have not yet used magnification loupes, and a large majority (71.6%) who showed that they do not use magnification loupes during preclinical training. Yet a great part of them (91.9%) believe that these loupes improve the speed, quality and accuracy of their work and thus reduces the visual stress. In addition, it was found that although a relatively high proportion of participants use magnification loupes to perform clinical procedures, there is a major barrier to their adoption, particularly costs (58.3%) and physical discomfort, e.g., headaches and neck

pain. In addition, significant interest in continuing education on magnification loupes (85.7%) shows the necessity for more intensive training and materials to promote effective utilisation of magnification loupes.

**Table (4): participants' practice toward using dental magnification loupes (n=483).**

<b>Parameter</b>		<b>No.</b>	<b>Percent (%)</b>
<b>Year of dentistry when started using magnification loupes</b>	3rd year	32	6.6
	4th year	50	10.4
	5th year	98	20.3
	6th year	26	5.4
	Internship	52	10.8
	Not used yet	225	46.6
<b>Do you use magnification loupes in pre-clinical levels?</b>	No	346	71.6
	Yes	137	28.4
<b>Do you use magnification loupes for Clinical Practice?</b>	No	257	53.2
	Yes	226	46.8
<b>What are the clinical procedures done using magnification loupes?</b>	Operative dentistry	337	69.8
	Endodontics	397	82.2
	Prosthodontics	223	46.2
	Periodontics	109	22.6
	Oral surgery	107	22.2
<b>How frequently are magnification loupes used during dental procedures?</b>	Always	114	23.6
	Sometimes	268	55.5
	Never	101	20.9
<b>Reason for not using magnification loupes (n=412)</b>	Headache	112	27.2
	Neck pain	73	17.7
	Vision adjustment	140	33.9
	High cost	240	58.3
	Do not want to rely on using for all cases	166	40.3
<b>Do you believe magnification loupes improve speed, quality, accuracy of working, reduce visual stress while maintaining the posture?</b>	No	39	8.1
	Yes	444	91.9
<b>Would you like to attend any future continuing dental education programs related to magnification loupes in dentistry?</b>	No	69	14.3
	Yes	414	85.7

\*Results may overlap

The data shown in Table 5 demonstrates a large discrepancy in the surveyed population's viewpoints relative to the deterrence for use of dental magnification loupes. Indeed, a massive 82.8% of respondents reveal a low attitude level, which means that a big chunk of them may not value the perceived and accept these tools in their dental practice. Yet, only 17.2% exhibited high attitude level, indicating a possibility of stumbling blocks, including lack of familiarity, doubt about the benefits thereof, or monetary details.

**Table (5): Shows attitude toward using dental magnification loupes score results.**

	Frequency	Percent
High attitude level	83	17.2
Low attitude level	400	82.8
Total	483	100.0

Table 6 provides a disturbing trend in terms of awareness of dental magnification loupes among the dental professionals with only 35.8 percent showing a high level of awareness. Unsurprisingly, far from this, the majority, 64.2%, of respondents show a low level of awareness, which means a huge gap in knowledge that could have negative effect on the quality of patient care and clinical outcomes.

**Table (6): Shows awareness toward using dental magnification loupes score results.**

	Frequency	Percent
High level of awareness	173	35.8
Low level of awareness	310	64.2
Total	483	100.0

Table 7 presents concerning data regarding the use of dental magnification loupes among the practitioners wherein practically, the overwhelming majority 90.3% indicate lower practice utilization of these tools. On the opposite end of the spectrum, only 9.7% of the respondents reported achieving a high practice level of SMT development, which indicates an enormous gap in the adoption of a tool so fundamental to precision and efficiency for dental procedures.

**Table (7): Shows practice toward using dental magnification loupes score results.**

	Frequency	Percent
High practice level	47	9.7
Low practice level	436	90.3
Total	483	100.0

Table (8) shows that attitude toward using dental magnification loupes has statistically significant relation to gender (P value=0.0001) and region (P value=0.008). It also shows statistically insignificant relation to current educational level.

**Table (8): Relation between attitude toward using dental magnification loupes and sociodemographic characteristics.**

<i>Parameters</i>		<i>Attitude level</i>		<i>Total (N=483)</i>	<i>P value*</i>		
		<i>High attitude level</i>	<i>Low attitude level</i>				
<b>Gender</b>	Female	28	229	257	0.0001		
		33.7%	57.3%	53.2%			
	Male	55	171	226			
		66.3%	42.8%	46.8%			
<b>Region</b>	Northern region	3	17	20	0.008		
		3.6%	4.3%	4.1%			
	Southern region	26	59	85			
		31.3%	14.8%	17.6%			
	Central region	26	132	158			
		31.3%	33.0%	32.7%			
	Eastern region	6	41	47			
		7.2%	10.3%	9.7%			
	Western region	22	151	173			
		26.5%	37.8%	35.8%			
	<b>Current educational level</b>	• Dental practitioner	24	108		132	0.306
			28.9%	27.0%		27.3%	
Third year		7	29	36			
		8.4%	7.2%	7.5%			
• Fourth year		10	96	106			
		12.0%	24.0%	21.9%			
• Fifth year		10	40	50			
		12.0%	10.0%	10.4%			
• Sixth year		22	90	112			
		26.5%	22.5%	23.2%			
• Internship		10	37	47			
		12.0%	9.3%	9.7%			

**\*P value was significant if  $\leq 0.05$ .**

Table (9) shows that awareness toward using dental magnification loupes has statistically significant relation to current educational level (P value=0.001) and region (P value=0.004). It also shows a statistically insignificant relation to gender.

**Table (9): Awareness toward using dental magnification loupes in association with sociodemographic characteristics.**

<b>Parameters</b>		<b>Awareness level</b>		<b>Total (N=483)</b>	<b>P value*</b>		
		<b>High level of awareness</b>	<b>Low level of awareness</b>				
<b>Gender</b>	Female	86	171	257	0.250		
		49.7%	55.2%	53.2%			
	Male	87	139	226			
		50.3%	44.8%	46.8%			
<b>Region</b>	Northern region	12	8	20	0.004		
		6.9%	2.6%	4.1%			
	Southern region	21	64	85			
		12.1%	20.6%	17.6%			
	Central region	59	99	158			
		34.1%	31.9%	32.7%			
	Eastern region	24	23	47			
		13.9%	7.4%	9.7%			
	Western region	57	116	173			
		32.9%	37.4%	35.8%			
	<b>Current educational level</b>	• Dental practitioner	60	72		132	0.001
			34.7%	23.2%		27.3%	
Third year		11	25	36			
		6.4%	8.1%	7.5%			
• Fourth year		20	86	106			
		11.6%	27.7%	21.9%			
• Fifth year		16	34	50			
		9.2%	11.0%	10.4%			
• Sixth year		45	67	112			
		26.0%	21.6%	23.2%			
• Internship		21	26	47			
		12.1%	8.4%	9.7%			

**\*P value was considered significant if  $\leq 0.05$ .**

Table (10) shows that practice toward using dental magnification loupes has statistically significant relation to current educational level (P value=0.001) and region (P value=0.0001). It also shows statistically insignificant relation to gender.

**Table (10): Practice toward using dental magnification loupes in association with sociodemographic characteristics.**

<i>Parameters</i>		<i>Practice level</i>		<i>Total (N=483)</i>	<i>P value*</i>		
		<i>High practice level</i>	<i>Low practice level</i>				
<i>Gender</i>	Female	31	226	257	0.065		
		66.0%	51.8%	53.2%			
	Male	16	210	226			
		34.0%	48.2%	46.8%			
<i>Region</i>	Northern region	9	11	20	0.0001		
		19.1%	2.5%	4.1%			
	Southern region	2	83	85			
		4.3%	19.0%	17.6%			
	Central region	19	139	158			
		40.4%	31.9%	32.7%			
	Eastern region	2	45	47			
		4.3%	10.3%	9.7%			
	Western region	15	158	173			
		31.9%	36.2%	35.8%			
	<i>Current educational level</i>	• Dental practitioner	5	127		132	0.001
			10.6%	29.1%		27.3%	
Third year		0	36	36			
		0.0%	8.3%	7.5%			
• Fourth year		8	98	106			
		17.0%	22.5%	21.9%			
• Fifth year		6	44	50			
		12.8%	10.1%	10.4%			
• Sixth year		19	93	112			
		40.4%	21.3%	23.2%			
• Internship		9	38	47			
		19.1%	8.7%	9.7%			

*\*P value was considered significant if  $\leq 0.05$ .*

### **Discussion:**

The aim of the present study was to assess the awareness, attitudes, and practice towards the use of dental magnification loupes among dental students and practitioners in Saudi Arabia. We found that the perceptions and behaviors surrounding the use of these essential tools in dental practice were complex. While a significant proportion of participants showed that magnification loupes had advantages (including better accuracy and ergonomics), the actual use was low. Finally, this discussion draws connections with the broader literature on dental magnification and discusses the limitations of the present work.

This study's results showed a great majority of the respondents were aware of magnification benefits (94.2%) and the usage to improve the quality of their work, but the usage of magnification in clinical procedures was not 58.2%. This difference fits with what Abuzinadah and Alsulimani found: most dentists in Saudi Arabia know how to use magnification tools, but they don't always do so [12]. Similarly, Wajngarten and Garcia noted that although magnification has been beneficial, many dental students and practitioners limit it to traditional techniques because of multiple barriers, including the costs and discomfort associated with wearing loupes for prolonged periods [13]. This implies a pertinent chasm between cognizance and usable utilization, which might arise from under-sourced graduation training and the display of magnification instruments.

The study also showed that about a third of respondents (32.8%) had received no workshop or course on magnification, which indicates that they lack educational initiatives. This accords with the work by Kamal et al. and rightly so, who stressed that dental education must promote students' ergonomic practices through magnification training and help prevent muscular disorders in students. The primary reason that has been observed with low adoption rates in this study is that the lack of formal education on how to use loupes may put dental students and practitioners at a disadvantage in learning to use these tools properly.

However, the narrative gets cloudier still because participants reported high confidence levels—64 percent stating they would continue treatment without magnifying tools. However, this evidence contradicts the claim that magnification enhances outcomes. For example, studies have shown that magnification significantly improves visual acuity and decreases the chance of developing musculoskeletal disorders among dental professionals [13, 15]. The results of this study suggest that overestimating one's abilities without magnification may degrade patient care. This agrees with the findings of Eichenberger et al. [16], who reported that many practitioners underestimate the performance-enhancing value of loupes.

Also, it found that magnification loupes have significant barriers to their adoption, including high costs and the problems of headaches and neck pain associated with physical discomfort. As Wajngarten and Garcia found, magnification devices will reduce the neck's angular deviation, but they also said that using these devices incorrectly could cause ergonomic problems [13]. These barriers show what they say might be hard to control and accommodate safely. Loupes have the potential to offer benefits for posture and overall health, but the discomfort caused by prolonged use could cause practitioners to avoid using them. This highlights the need for ergonomic training and the development of more comfortable magnification devices to facilitate their use in clinical settings.

Cognizance of the available types of magnification loupes was also wanting, as 44.4% of participants were unaware of the options available. This lack of knowledge is alarming, as familiarity with various magnification tools is crucial for informed decision-making in clinical practice. Several previous studies have demonstrated that dental students educated about the various types of loupes are more likely to adopt them [17, 18]. This implies that dental professionals can enhance their utilization of magnification devices by strengthening their awareness through trained educational programs.

The graduate study also showed a distinct gender difference in the reported musculoskeletal disorders, with female dentists reporting much greater discomfort than their male counterparts. There is research

on work-related musculoskeletal disorders that suggests female dentists are more likely to get these kinds of problems because of the ergonomic problems that come up when men and women are different heights [19, 20]. Some of these differences could be fixed by creating and customizing ergonomic training and support. This would also help lower some of the risks that female practitioners face, making the workplace healthier.

However, despite valuable insights received through this study, there are some limitations. The cross-sectional design restricts the ability to establish a causal relationship between magnification loupes awareness, attitudes, and practices. Furthermore, the use of self-reported data may impart bias in that participants could overestimate their awareness and usage of loupes. Future research using longitudinal designs and objective measures of magnification would better understand the relationship among the factors that contribute to the use of these tools in dental practice.

**Conclusion:**

This study has identified a critical gap between awareness and practical use of dental magnification loupes by Saudi dental students and practitioners. Although the advantages of magnification are well known, barriers including discomfort, expense, and absence of educational opportunities limit its usefulness. Encompassing the challenge of enhancing clinical practice and patient outcomes in dentistry, we suggest that addressing these challenges requires better training and ergonomic support. As the field changes, it will be important to continue building a culture that supports the use and awareness of magnification tools. This will help dental care keep getting better.

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**Ethical approval**

We obtained informed consent from each participant after fully explaining the study and emphasizing that participation is voluntary. We securely saved the collected data and used it solely for research purposes.

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**Conflict of interests**

The authors declare no conflict of interest.

**Informed consent:**

We obtained written informed consent from each individual study participant.

**Data and materials availability**

All data associated with this study are present in the paper.

**References:**

1. Senthilkumar V, Ramesh S, Subbarao C. Kap survey on the usefulness of magnification during dental procedures amongst specialists and general dental practitioners. *Int J Dent Oral Sci.* 2021;8(5):2922–7.
2. • Wajngarten D., Botta AC, and Garcia PPNS. Magnification loupes in dentistry: A qualitative study of dental students' perspectives. *Eur J Dent Educ.* 2021;25(2):305–9.
3. Baharin S, Mohd Dom T, Anita Baharin S, Jun Fay L, Ningseh Mohd-Dom T. A Cross-sectional Survey on the Use of Magnification Devices in Mainstream Dental Practice. 2021;44(05):1983–91. Available from: <https://www.surveysystem.com/sscalc.htm>
4. Carr GB, Murgel CAF. The Use of the Operating Microscope in Endodontics. *Dent Clin North Am.* 2010;54(2):191–214.
5. Eichenberger M, Perrin P, Neuhaus KW, Bringolf U, Lussi A. Influence of loupes and age on the near visual acuity of practicing dentists. *J Biomed Opt.* 2011;16(3):035003.
6. Narula K, Kundabala M, Shetty N, ShIn a preclinical laboratory, dental interns and final-year BDS students used magnification loupes to look at tooth preparations for Class II cavities. The study was published in *J Conserv Dent* in 2015 and had 18 articles.
7. Ramesh A, Junxi Guo A, Patel HJ, Huang J, Huang CC, de Mello-Neto JM, et al. The impact of magnification on undergraduate dental students' performance during cavity preparations: A systematic review. *J Dent Educ.* 2024; (November 2023): 1–10.
8. Alhazzazi TY, Alzebiani NA, Alotaibi SK, Bogari DF, Bakalka GT, Hazzazi LW, et al. Awareness and attitude toward using dental magnification among dental students and residents at King Abdulaziz University, Faculty of Dentistry. *BMC Oral Health.* 2016;17(1):1–7.
9. Alrebdi A, Alkhudhair M, Alqifari F, Arabia S, Arabia S. Dental Faculty and Students Awareness and attitude towards the use of dental magnification tools: A cross-section study at the College of Dentistry, Qassim University. 2022; 13(9): 2799–804.
10. Sundaram G, Ramakrishnan T, Parthasarathy H, Raja M, Raj S. Disease: A cross-link of sorts! 2018; (May): 113–8.
11. Metta KK, Singh G, Altwirqi FAA, Alkathami AMA, Alsulami AMM, Kanaparthi S, et al. Awareness and attitude towards using magnification loupes among dental students: a cross-sectional study. *J Stomatol.* 2024;77(1):41–6.
12. Abuzinadah, S. and Alsulimani, O. (2023). The prevalence and consciousness of using magnification devices during restorative procedures among dental practitioners in Saudi Arabia. *Medical Science*, 27(135), 1-8. <https://doi.org/10.54905/diss/v27i135/e232ms3037>
13. Wajngarten, D. and Garcia, P. (2019). Effect of magnification devices on dental students' visual acuity. *PLOS ONE*, 14(3), e0212793. <https://doi.org/10.1371/journal.pone.0212793>

14. Kamal, A., Ahmed, D., Habib, S., & Almohareb, R. (2020). Ergonomics of preclinical dental students and potential musculoskeletal disorders. *Journal of Dental Education*, 84(12), 1438-1446. <https://doi.org/10.1002/jdd.12369>
15. Wajngarten, D., Pazos, J., Menegazzo, V., Novo, J., & Garcia, P. (2021). Magnification effect on fine motor skills of dental students. *PLOS ONE*, 16(11), e0259768. <https://doi.org/10.1371/journal.pone.0259768>
16. Eichenberger, M., Perrin, P., Neuhaus, K., Bringolf, U., & Lussi, A. (2011). Influence of loupes and age on the near visual acuity of practicing dentists. *Journal of Biomedical Optics*, 16(3), 035003. <https://doi.org/10.1117/1.3555190>
17. Braga, T., Robb, N., Love, R., Amaral, R., Rodrigues, V., Camargo, J., ... & Duarte, M. (2020). The impact of the use of magnifying dental loupes on the performance of undergraduate dental students undertaking simulated dental procedures. *Journal of Dental Education*, 85(3), 418-426. <https://doi.org/10.1002/jdd.12437>
18. Costa, R. (2024). Impact of using magnifying dental loupes on clinical performance during tooth preparation: a systematic review. *Journal of Clinical and Experimental Dentistry*, e186-e197. <https://doi.org/10.4317/jced.61098>
19. Salomon L, Zenhäusern R, Krämer R, Zitzmann NU (2024) Work-Related Musculoskeletal Pain in the Dental Profession. *Chron Pain Manag* 8: 158. <https://doi.org/10.29011/2576-957X.100058>
20. Meisha, D., Alsharqawi, N., Samarah, A., & Al-Ghamdi, M. (2019). Prevalence of work-related musculoskeletal disorders and ergonomic practice among dentists in Jeddah, Saudi Arabia. *Clinical Cosmetic and Investigational Dentistry*, Volume 11, 171-179. <https://doi.org/10.2147/ccide.s204433>