

AWARENESS AND ATTITUDE TOWARDS USING MAGNIFICATION LOUPES AMONG DENTAL STUDENTS: A CROSS-SECTIONAL STUDY

Kiran Kumar Metta¹, Gautam Singh¹, Faisal Ali Ahmed Altwirqi², Abdulaziz M.A. Alkathami², Abdulrhman Mansoor Magle Alsulami², Saraswathi Kanaparthi³, Vinod Bandela⁴ 

¹Department of Conservative Dental Sciences, Faculty of Dentistry, Ibn Sina National College for Medical Studies, Saudi Arabia

²Intern, Faculty of Dentistry, Ibn Sina National College for Medical Studies, Saudi Arabia

³Pedodontics and Preventive Dentistry, St. Joseph Dental College and Hospital, India

⁴Department of Prosthetic Dental Sciences, Faculty of Dentistry, Jouf University, Saudi Arabia

ABSTRACT

INTRODUCTION: Precision in dental treatment can be achieved by perfect visualization, and magnification devices play an essential role. Magnification is considered one of the biggest revolutions in the realm of modern dentistry. Innovation is a cornerstone of dentistry, and the recent breakthrough boosted a number of global investigations and increased knowledge in this area.

OBJECTIVES: The aim of this study was to evaluate the level of knowledge, awareness, and attitude towards using magnification loupes among dental students.

MATERIAL AND METHODS: A cross-sectional, questionnaire-based study was conducted in Jeddah City, Saudi Arabia. Study population was selected using cluster random sampling. Questionnaire was distributed online, and 255 dental students responded.

RESULTS: Data was tabulated and analyzed using statistical package for social sciences (SPSS) version 21.0. χ^2 test was applied to analyze data, and a p-value of less than 0.05 was considered statistically significant. Of the 255 respondents, 52% were females and 48% were males. 50.8% of participants were between 24 and 26 years old.

CONCLUSIONS: It was found that all respondents were aware of magnification loupes, and the most common sources of information were colleagues/friends, online/social networking sites, and company-sponsored demonstrations. Many individuals were aware of the advantages of using magnification loupes.

KEY WORDS: magnification loupes, endodontics, dental students, awareness, practices.

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INTRODUCTION

Magnification is considered one of the biggest revolutions in the realm of modern dentistry. Innovation is a cornerstone of dentistry, and the recent breakthrough boosted a number of global investigations and increased knowledge in this area. Operating microscope was intro-

duced into dentistry in late 1980s. The dental operating microscope was first developed by Dr. Gary B. Carr, and it was thought to help the endodontic apical procedures from magnification [1]. Additionally, Dr. Carr advocated the use of dental operating microscopes in a variety of periodontal and surgical endodontic procedures,

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ADDRESS FOR CORRESPONDENCE: Dr. Vinod Bandela,
Department of Prosthetic Dental Sciences, Faculty of Dentistry, Jouf University,
Saudi Arabia, e-mail: vinod.bandela@gmail.com

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identifying crown margins and post and core as well as diagnosing and excavating dental cavities [1-3].

Many dental professionals use magnification tools in their daily dental work, despite high cost and specialized training needed. Magnification tools are useful in dentistry because they increase treatment quality, reduce eye and posture strain, and lessen musculoskeletal harm. It is advised that dental professionals pursue training, so they can benefit from employing magnifying tools [1, 4-7]. Magnification tools are essential in the field of endodontics for finding concealed root canals, re-treatment cases, removing separated instruments, fixing perforations, and performing different stages of endodontic surgery [8].

Magnification tools are also extremely helpful in prosthodontic treatments, particularly in fixed prosthodontics, such as tooth preparation, to assess final impression, to seat crowns and bridges, and to identify minute occlusal inconsistencies [9-11]. Many dental professionals use magnifying loupes (MLs) to enhance the quality of clinical treatment, and even the beginners are using surgical loupes for prosthodontic and endodontic procedures [12]. In order to improve ergonomic work posture during dental treatments, surgical loupes' ability to magnify the viewing field might be a significant factor. Dental professionals experience multiple instances of neck and spinal torsion, hunched posture, and musculoskeletal diseases as a result of poor posture [13].

Only a few researchers have compared the use of magnification devices, and there are few scientific studies demonstrating the benefits of these tools in dentists' performance. However, there are not so many studies supporting the use of magnification loupes, especially among dental students during their pre-clinical training and clinical practice [1, 2].

OBJECTIVES

The aim of the present research was to evaluate the awareness and attitude towards using magnification loupes among dental students in Jeddah City, Saudi Arabia.

MATERIAL AND METHODS

This study was conducted in Ibn Sina National College for Medical Studies, Jeddah. Ethical clearance was obtained from Institutional Ethical Committee, with approval number of 014DP05102021. A cross-sectional, questionnaire-based study was conducted in Jeddah City using a self-structured, pre-tested, and closed-ended survey. The questionnaire was designed evaluating knowledge, awareness, attitude, and the use of magnification devices among dental students. Questions related to the application of magnification devices in prosthodontic, endodontic, restorative, periodontal, and surgical procedures were included.

The questionnaire was distributed online among dental students, who were randomly selected using cluster random sampling. The purpose of the study was explained, and 255 participants responded to the questionnaire. To ensure anonymity, names were not recorded. Statistical package for social sciences (SPSS) version 21.0 (SPSS Inc., Chicago, IL, USA) was applied to tabulate and analyze data. Knowledge, awareness, attitude, and the use of magnification devices were compared using χ^2 test. A *p*-value below 0.05 was considered statistically significant, while less than 0.001 was considered very significant.

RESULTS

In the study, 255 students responded to the questionnaire. However, some of them did not complete the study, leading to a final count of 246 participants (Table 1). There were 52% females and 48% males, 50.8% were between 24 and 26 years old, 46.3% were doing their internship, and the rest of the respondents were on their 3rd to 6th year of under graduation (Table 1).

It was observed that all the participants have heard of MLs, and the most common sources of information were colleagues/ friends (39%), followed by online/social networking sites (26.40%), company-sponsored demonstrations (15.90%), onsite workshops (10.20%), and dental graduation programs (8.50%).

When the awareness of advantages was considered, 93.9% were aware of MLs and 84.0% of the participants were aware of the advantages, such as time saving, helping with maintaining the posture of operator, improving the accuracy and quality of treatment, and visual stress reduction. About 89.4% of the respondents were aware of the disadvantages of MLs, whereas 69.5% were knew

TABLE 1. Baseline characteristics of participants

Factor	n	%
Gender		
Female	128	52.0
Male	118	48.0
Age group (years)		
18-20	13	5.3
21-23	64	26.0
24-26	125	50.8
> 26	44	17.9
Academic year level		
3 rd year	15	6.1
4 th year	36	14.6
5 th year	39	15.9
6 th year	42	17.1
Intern	114	46.3

of the disadvantages, including neck pain, high initial cost, and more practice needed.

When evaluating the awareness of the range of magnification, 59.8% of the respondents were aware, 31.7% were not aware, and 8.5% were unable to comment on this. Regarding flip-up of MLs, 61.0% were aware, 31.7% were not aware, and 7.3% were unable to respond to this question. It was also found that 59.3% were aware of TTL property of MLs, 33.7% were unaware, and 6.9% were unable to provide the response (Table 2) [2, 12].

When compared the awareness level with the level of academic year, it was found that interns were significantly more aware of the advantages ($p < 0.001$), disadvantages ($p < 0.001$), the range of magnification that can be achieved with MLs ($p < 0.001$), flip-up magnification loupes ($p < 0.001$), and TTL of MLs (Table 3).

When the utilization of MLs was considered, 42.7% of the students started using in 3rd year of dental graduation program, 77.2% used them in pre-clinical level, and 85.0% utilized them in certain clinical procedures. The most common clinical procedure, in which MLs

were used was endodontics (78.9%), and it was reported by 23.4% of the participants using them for all dental clinical procedures. With regards to the frequency of MLs usage, 49.6% used them sometimes, 36.2% declared using MLs always, and 14.2% never used them.

The most common reason for not using MLs was their high price (18.1%), followed by neck pain (16.8%). Majority of the participants (98.4%) believed that MLs improve speed, quality, and accuracy of working, reduce visual stress while maintaining the posture. Nearly 91.1% of the students declared to attend in future any of continuing dental education (CDE) programs related to MLs in dentistry (Table 4).

DISCUSSION

In addition to current knowledge, manual skills are crucial in obtaining accurate results in dentistry, and magnification loupes support good visibility of the operating field. In case of procedures involving teeth and soft

TABLE 2. Awareness related to magnification loupes and their properties

Question	Response	n	%
Are you aware of the advantages of using magnification loupes in dentistry?	Cannot say	7	2.8
	No	8	3.3
	Yes	231	93.9
Advantages as reported by participants	Save time	29	12.6
	Help with maintaining the posture of the operator (ergonomics)	10	4.3
	Improve the accuracy of treatment	20	8.7
	Improve the quality of treatment	20	8.7
	Reduce visual stress	13	5.6
	All the above	194	84.0
Are you aware of the disadvantages of using magnification loupes in dentistry?	Cannot say	2	0.8
	No	24	9.8
	Yes	220	89.4
Disadvantages as reported by participants	Neck pain	31	14.1
	Initial high cost	42	19.1
	More practice needed	25	11.4
	All the above	153	69.5
Are you aware of the range of magnification that can be achieved with magnification loupes?	Cannot say	21	8.5
	No	78	31.7
	Yes	147	59.8
Are you aware of flip-up of magnification loupes?	Cannot say	18	7.3
	No	78	31.7
	Yes	150	61.0
Are you aware of through-the-lens (TTL) magnification loupes used in dentistry?	Cannot say	17	6.9
	No	83	33.7
	Yes	146	59.3

TABLE 3. Comparison of awareness related to magnification loupes with academic year levels

		Academic year					p-value*
		3 rd	4 th	5 th	6 th	Intern	
Awareness of advantages	No	6	2	2	2	3	< 0.001
		40.0%	13.3%	13.3%	13.3%	20.0%	
	Yes	9	34	37	40	111	
		3.9%	14.7%	16.0%	17.3%	48.1%	
Awareness of disadvantages	No	3	5	5	4	9	< 0.001
		11.5%	19.2%	19.2%	15.4%	34.6%	
	Yes	12	31	34	38	105	
		5.5%	14.1%	15.5%	17.3%	47.7%	
Awareness of the range of magnification that can be achieved	No	9	26	16	16	32	< 0.001
		9.1%	26.3%	16.2%	16.2%	32.3%	
	Yes	6	10	23	26	82	
		4.1%	6.8%	15.6%	17.7%	55.8%	
Awareness of flip-up magnification loupes	No	10	24	12	17	33	< 0.001
		10.4%	25.0%	12.5%	17.7%	34.4%	
	Yes	5	12	27	25	81	
		3.3%	8.0%	18.0%	16.7%	54.0%	
Awareness of through the lens (TTL) magnification loupes	No	9	26	12	20	33	< 0.001
		9.0%	26.0%	12.0%	20.0%	33.0%	
	Yes	6	10	27	22	81	
		4.1%	6.8%	18.5%	15.1%	55.5%	

tissues, it is advisable to enlarge the treatment area, e.g., by using magnification loupes. MLs are indeed an evolution from the conventional method of macro-dentistry to the high precision micro-dentistry. The use of magnification devices can lead to improved procedural outcomes, thereby resulting in a higher quality of care.

Interestingly, in the current study, only 8.5% of the students learned about using magnifiers as part of their curriculum. This could be one of the reasons why over 30% of the students did not know the magnification values that can be obtained with the help of loupes and the ways of their use.

In the current study, 46.3% of the interns were using MLs and 93.9% of the respondents were aware of the advantages, while 5.5% of the interns were using MLs and 81.8% agreed on the advantages in a study [1].

In the present research, 78.9% of the respondents reported that MLs are of great help in endodontics.

Brown *et al.* [14] showed that the use of dental loupes in non-surgical endodontics can be considered as the minimum standard, while Perin *et al.* [15] found that younger dentists (< 40 years) could be able to visualize 0.05 mm structure at the root canal orifice compared with older age group of dentists (≥ 40 years). Buhrlay *et al.* [16] reported that the location and detection rate of mesio-buccal second canal (MB2) of maxillary molar

was approximately three times more when magnification loupes were used compared with non-magnification group.

In the current study, 85.0% of the participants were using MLs for clinical procedures, while in Alhazzazi *et al.* study [1], only 21.4% of the respondents were using MLs. About 89.4% of the students were aware of the disadvantages of MLs, whereas 69.5% were aware of all of them, such as neck pain, initial high cost, and more practice needed. In a study by Pazos *et al.* [17], the effectiveness of pre-clinical techniques was unaffected with the use of Galilean and Keplerian magnifying lenses, while the ergonomic posture improved.

The assessment on practices related to MLs showed that 42.7% of the students started using them in 3rd year of the graduation program, 77.2% used them in pre-clinical years, and 85.0% used them for various clinical procedures. Utilizing MLs improved psycho-motor skills necessary for cavity preparation, resulted in faster preparation, not requiring assistance, and showing better quality of the students' performance [18].

One of the most common reasons for not using MLs was neck pain that was mentioned by 6.8% of the respondents, and majority of the participants (98.4%) believed that MLs improve speed, quality, and accuracy of working as well as reduce visual stress while maintaining the posture.

TABLE 4. Practices related to magnification loupes among participants

		<i>n</i>	%
Year of dentistry when started using magnification loupes	3 rd year	105	42.7
	4 th year	75	30.5
	5 th year	33	13.4
	6 th year	16	6.5
	Internship	17	6.9
Utilization of magnification loupes in pre-clinical levels	No	56	22.8
	Yes	190	77.2
Utilization of magnification loupes for clinical procedures	No	37	15.0
	Yes	209	85.0
Clinical procedures done using magnification loupes	Operative dentistry	21	10.0
	Endodontics	165	78.9
	Prosthodontics	5	2.4
	Periodontics	4	1.9
	Oral surgery	3	1.4
	All of the above	49	23.4
Frequency of use MLs in dental procedures	Always	89	36.2
	Sometimes	122	49.6
	Never	35	14.2
Reason for not using MLs	Headache	18	11.6
	Neck pain	26	16.8
	Vision adjustment	23	14.8
	High cost	28	18.1
	Do not want to rely on using for all cases	24	15.5
	All of the above	48	31.0
Do you believe MLs improve speed, quality, accuracy of working, reduce visual stress while maintaining the posture?	No	4	1.6
	Yes	242	98.4
Would you like to attend any future CDE programs related to MLs in dentistry?	No	22	8.9
	Yes	224	91.1

In a study by Eggmann *et al.* [13], ergonomics improvement with magnification loupes was found. It is unclear why students reported both improved work ergonomics and neck pain while using the loupes. Did the study data take into account the position, in which the participants worked? Or maybe the reason is the lack of proper training? Can it be another reason? More research is needed to help the dentists to overcome these problems.

CONCLUSIONS

Regarding the source of knowledge about magnification loupes in dentistry, when assessing the awareness of the advantages, most of the participants were aware of time saving, maintaining operator posture, improvement of treatment accuracy and quality, and reduction of visual stress. It would be beneficial to introduce

the knowledge about the magnification loupes into the dental educational system.

ETHICAL POLICY AND INSTITUTIONAL REVIEW BOARD STATEMENT

Ethical clearance was obtained from Institutional Ethical Committee, Ibn Sina National College for Medical Studies, Jeddah, Saudi Arabia, with approval number of 014DP05102021.

CONFLICT OF INTERESTS

The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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