



ASSESSING THE PERSPECTIVES OF DENTAL PROFESSIONALS IN USING MAGNIFICATION TOOLS IN DENTAL SETTINGS

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ABSTRACT

Background: A more ergonomic working posture, freely accessible magnification levels, and optimal lighting of the operation area are guaranteed through the surgical microscope. In contrast, increased weight of the lenses and minimized stability of field of vision is resultant through increased magnification. However, the effectiveness of magnification tools is not assessed from the perspectives of dental professionals. Thereby, the study aims to assess the perspectives of dental professionals in using magnification tools in dental settings. **Purpose:** The sole purpose of this study is to assess different opinions of dental professionals regarding the benefits of using magnifying tools in dental practices. **Methodology:** The data was obtained from 111 dental professionals with the help of a questionnaire. The data was analyzed using descriptive statistics and paired sample T-test. A Statistical Package for Social Sciences (SPSS) version 22 has been used for data analysis. **Result:** The findings have revealed that most of these respondents were less than 35 years of age. In addition, paired sample t-test revealed that male professionals (SD=0.378) and female professionals (SD=0.415) showed no significant association with magnification loupes. Similarly, results in terms of using magnification loupes with the inclusion of light, revealed that male and female respondents with SD as 0.378 and 0.196, respectively, showed significant association having p value as 0.000. Moreover, according to majority of these participants, efficiency, posture, and accuracy are key aspects that are supposed to be taken under consideration, while using magnifying tools. **Conclusion:** There is still an immense growth of magnification devices usage in different dental specialties despite of the expenses. In accordance with the findings, it is quite evident that the usage of magnifying devices is beneficial for the field of dentistry especially in terms of carrying out different dental treatments.

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INTRODUCTION

The manual dexterity and human skill are of great importance in clinical dentistry. Visual acuteness can be used to achieve the surgical precision, but it can be improved numerous times through effective magnifying tools. The dental practice has been revolutionized through microscopic magnifying devices (Alhazzazi *et al.*, 2017). It is a fact that the conventional methods of macro-dentistry develop a high precision micro-dentistry. Thereby, these devices have been adopted by almost all spheres of precision dentistry. The benefits of using microsurgical techniques have been extensively reported as compared to conventional microsurgical procedures (Del Fabbro *et al.*, 2015). Advanced results are offered by this new method with respect to passive wound closure and further assists in reducing tissue trauma, resulting in rapid healing.

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This treatment was not possible or accessible in conventional macrosurgical techniques (Arora, Kaur & Kumar, 2016).

The usage of magnification and tangible use of magnification devices in clinical practice of dentistry are not explored from the perspectives of dental professionals. There is a dearth of literature and reports that assess the perspectives of dental professionals in using magnification tools in dental settings. There are two types of magnification tools; surgical microscope and loupes. Surgical microscope and loupes both enable clinicians to perform tasks regardless of visual acuity (Hegde & Hegde, 2016). The novelty of this study embodies from the perspectives of dental professionals, who actualize the challenges and benefits of using magnification tools considerably. The significance of assessing the perspectives of dental professionals can be actualized in enhancing the quality of care endowed to patients and expanding the range of treatments that can be facilitated.

LITERATURE REVIEW

Hegde & Hegde (2016) have assessed the significance of magnification tools in the contemporary dentistry. The study has asserted that practitioners are increasingly opting magnification systems, which include microscopes and loupes in their clinical practice. Magnification-enhanced precision dentistry is increasingly emerging to improve the vision of dental professionals in terms of clinical and laboratory procedures. The study has revealed that magnifications are deliberately becoming an essential factor of modern-day dentistry, and mitigating the disadvantages of cost, maneuverability and steep learning curve of the equipment.

Taschieri, *et al.* (2013) have reviewed the history of magnification tools and its implications in the clinical dentistry. The study has reviewed that surgical operating microscope and dental loupes are included in magnification tools, which are used for implant dentistry, non-surgical periodontal procedures, better visualization, prosthetic restorations and routine endodontic procedures. The use of magnification in dental practice is emerged in invasive dental procedures with ease and precision.

Mallikarjun, *et al.* (2015) have reviewed the assorted magnification systems, application and its principles of microsurgery in assorted dentistry fields. It has been reviewed that magnification becomes an essential tool in the dental procedures with respect to enhance ergonomics, to reduce fatigue, and to minimize invasiveness.

Arora, Kaur & Kumar (2016) have reviewed the role of magnification in endodontics and conservative dentistry in recent practice. The study has reviewed that visual acuity and precise motor skills are required as conservative dentistry become more complex and sophisticated. The clinically and histological aspects are modified due to the advancement of new materials and new treatment procedures. This review has emphasized the significance of surgical operating microscopes, endoscopes, oroscopes, magnifying glasses, dental loupes and optical microscopes as alternative magnification devices for endodontics and dental treatments.

Isett & Hicks (2018) have emphasized the role and significance of using microscope to monitor the position of patient and operator. The commencement of operating microscope is attributed through the major contribution in the field of dentistry. The endodontist treatment was diagnosed through illumination and high magnification aspects, which assist in detecting extra canals, retrieval of fractured instruments, inhibiting the presence of procedural errors, and usage of newer systems during integration. The study has emphasized that the field of endodontics is comprehensively modified through the adoption of operating microscope to improve successful treatment therapy. The use of effective techniques, proper settings, and correct equipment's provide ease to dental practitioners in enhancing their treatments.

Sreevatsan *et al* (2015) have discussed the fundamental aspects of digital photography in general and clinical dental technical aspects and accessories. The study has summarized that digital photography can be used to record the details of dental treatment during the intraoral and oro-facial conditions. The dental practitioners can enhance their communication and interaction with the patient about treatment planning by adopting appropriate skills and photographic methods.

SurabhiRairam (2014) has investigated the effectiveness of image processing in advanced esthetic dentistry. MATLAB image processing system was used to investigate the effectiveness of image processing. Computer based image processing is enabled through digital acquisition of dental photographs to improve image quality and escalate its accuracy. The study has identified that MATLAB image processing assists in image analysis, image segmentation, image compression, image restoration, and image enhancement for dental procedures. Thereby, the study has recommended that image processing should be adopted by dental practitioners to improve better patient communication, planning a cohesive treatment to patients, and improving diagnostic effectiveness.

Dable, *et al.* (2014) have evaluated and compared the endodontic treatment effects by using magnification devices. A systematic literature review has been performed including articles from MEDLINE, EMBASE, and Cochrane Oral Health from 1946 to October 2015. The study has shown a paucity of investigative studies in this field that reveals the effectiveness of magnification devices in the endodontic treatment. Therefore, the study has asserted the implication of magnification devices in enhancing treatment outcome and high number of factors, affecting the success of endodontic surgical procedure.

Taschieriet *al* (2006) aimed to study the risks caused by ineffective posture of dental studies while treating. A rapid upper limb assessment has been used to assess different postures. Magnification system was used to evaluate different postures of ninety students from II BDS. The results have shown significant higher scores of rapid upper limbs assessment without using the magnification system as compared to the use of magnification system. The study has further revealed that dental practitioners were dissatisfied with the current working patterns of II BDS students, which can deteriorate the performance of students and ultimately leads to musculoskeletal diseases.

Eichenberger, *et al.* (2015) has examined the relationship between visual acuity and different magnification devices to assess the performance of dentists in optimized clinical situation. A self-structured questionnaire was constructed to collect data from 69 dentists from 40 private practices. The results have shown that 64% dentists prefer using a dental loupe, 45% dentists prefer using Galilean loupes and 16% dentists prefer Keplerian loupes. There was a significant relationship found between self-assessed and the objective visual performance of the dentists. The aforementioned studies have reviewed and discussed the significance of magnification tools in the fields of dentistry, but evidence-based studies lack in this context that can contribute a significant contribution for dental professionals and clinicians.

METHODOLOGY

In order to assess the perspectives of dental professionals, a quantitative research design has been used based on a self-structured questionnaire. The rationale for using quantitative research design is to assess the perspectives of dental professionals in terms of challenges and benefits of using magnification tools in dentistry. A total of 111 dental professionals has been enrolled in this study, so that their perspectives can be assessed comprehensively. The data has

been analyzed using descriptive statistics and paired sample T-test. A Statistical Package for Social Sciences (SPSS) version 22 has been used for data analysis.

RESULTS

The data was collected from 111 dental professionals. The results illustrated that 80.2% of these respondents were less than 35 years of age; whereas, only 14.4% were aged between 35-50 years. Furthermore, the segregation on the basis of gender represents 53.2% of male professionals and 45.9% of female professionals. In addition to that, 23.4% of these respondents were general dentist; whereas, some of them were assistant professor, associate professor, consultants, specialists, etc. Furthermore, 51.4% of these respondents had their area of expertise in general dentistry (Table 1).

Table 1 Demographics

Age group		
	N	%
<35	89	80.2
35-50	16	14.4
>50	5	4.5
Missing	1	0.9
Gender		
Male	59	53.2
Female	51	45.9
Missing	1	0.9
Educational Level		
Professor		
Associate Professor	6	5.4
Professor	2	1.8
Assistant Professor	6	5.4
Consultant	6	5.4
Specialist	3	2.7
Demonstrator	14	12.6
Postgraduate	16	14.4
Reside	26	23.4
General Dentist	19	17.1
Intern	13	11.7
Undergraduate		
Specialty		
General Dentist	57	51.4
Orthodontist	1	0.9
Restorative	8	7.2
Prosthodontist	13	11.7
Endodontist	14	12.6
Periodontist	6	5.4
Pedodontist	2	1.8
OMF Surgeon	1	0.9
Prosth/Perio	1	0.9

Additionally, these respondents were asked about what type of magnification they prefer. 81.1% of the respondents illustrated that they do not use magnification loupes in dental practices; whereas, 18.9% stated that they prefer using magnifying loupes. In terms of magnification loupes with the inclusion of light, 88.3% of respondents stated that they do not use inclusion light; however, 11.7% declared that they use magnifying loupes with light to carry out dental procedures. Moreover, 31.5% of them stated that they use light only without any magnification tool, but still 68.5% of these respondents stated that they do not go about such magnification either. Among these professionals, 59.5% stated that they do not use any type of magnification in dentistry (Table 2).

Table 2 Types of Magnification

Magnification loupes		
	N	%
No	90	81.1
Yes	21	18.9

Magnification loupes + Light		
	N	%
No	98	88.3
Yes	13	11.7
Lights only		
No	76	68.5
Yes	35	31.5
None		
No	66	59.5
Yes	43	38.7
Missing	2	1.8

Participants were further asked about what different aspects they keep in consideration while using magnification tool. In terms of efficiency, 27% of them stated that they want magnifying tool to be effective; whereas, 23.4% of these respondents thought that efficiency is not a major aspect. In addition, 42.3% of respondents did not consider time consumption as a relevant aspect that plays its part while using magnifying tool. However, 49.5% of the participants did not give their opinion in this regard. Furthermore, respondents were asked about their perception in regard to the enhancement of posture during the usage of magnification tool, for which 27% of them did not consider enhance posture as a key aspect. 23.4% respondents believed that enhance posture should be considered, while using magnifying tools in dental procedures and practices. Lastly, among these respondents, 32.4% of them stated that accuracy is a key aspect that should be considered, while using magnifying tool in dentistry; however, according to 18% of these respondents, accuracy is not much of an important aspect that requires improvement (Table 3).

Table 3 Main improvement aspect while using any magnifying tool

Efficiency		
	N	%
No	26	23.4
Yes	30	27.0
Missing	55	49.5
Time consumption		
No	47	42.3
Yes	9	8.1
Missing	55	49.5
Enhance posture		
No	30	27.0
Yes	26	23.4
Missing	55	49.5
Accuracy		
No	20	18.0
Yes	36	32.4
Missing	55	49.5

In addition, paired sample t-test revealed that male professionals (SD=0.378) and female professionals (SD=0.415) showed no significant association with magnification loupes, having p value as 0.226. Moreover, results in terms of using magnification loupes with the inclusion of light, revealed that male and female respondents with SD as 0.378 and 0.196, respectively, showed significant association having p value as 0.000, at 5% level of significance. However, both male respondents with 0.439 SD and female respondents with 0.493 SD, showed significant association with the usage of lights only during dental procedures, having p value of 0.004 at 5% level of significance (Table 4).

Table 4 Paired Sample t-test analysis

	Gender	N	Mean	Std. Deviation	Std. Error Mean	Significance
Magnification loupes	Male	59	.17	.378	.049	0.226
	Female	51	.22	.415	.058	
Magnification loupes + Light	Male	59	.17	.378	.049	0.000
	Female	51	.04	.196	.027	
Lights only	Male	59	.25	.439	.057	0.004
	Female	51	.39	.493	.069	

Table 5 has shown the frequencies and percentages for procedures used in fixed prosthodontics surgery. The findings have indicated that impression (98%) was mostly used procedure in fixed prosthodontics followed by laboratory procedures (96%), provisional fabrication (96%), occlusal adjustment (96%), post cementation (96%), cementation (94%) and canal preparation (67%).

Table 5 Procedural Methods in Fixed Prosthodontics

Procedures	No loupe	Loupe	Microscope	Both
Tooth preparation	65 (58.6)	36 (32.4)	1 (0.9)	-
Retraction cord packing	92 (82.9)	10 (9)	-	-
Impression	98 (88.3)	4 (3.6)	-	-
Prosthesis try-in	93 (83.8)	9 (8.1)	-	-
Cementation	94 (84.7)	8 (7.2)	-	-
Sectioning prosthesis	92 (82.9)	9 (8.1)	1 (0.9)	-
Canal preparation	67 (60.4)	30 (27)	5 (4.5)	-
Post pattern fabrication	93 (83.8)	9 (8.1)	-	-
Post cementation	96 (86.5)	6 (5.4)	-	-
Retrieval of cemented post	87 (78.4)	12 (10.8)	3 (2.7)	-
Occlusal adjustment	96 (86.5)	6 (5.4)	-	-
Provisional fabrication	96 (86.5)	6 (5.4)	--	-
Laboratory procedures	96 (86.5)	5 (4.5)	1 (0.9)	-

Table 6 has shown the frequencies and percentages for procedures used in pedodontics surgery. The findings have indicated that cementing space maintainer (100%) was mostly used procedure in pedodontics followed by non-surgical extraction (100%), crown placement (96%), pulpectomy (93%), and restorative procedures (82%).

Table 6 Procedural Methods in Pedodontist

Procedures	No loupe	Loupe	Microscope	Both
Caries excavation	86 (77.5)	17 (15.3)	-	-
Restorative procedures	91 (82)	12 (10.8)	-	-
Crown placement	96 (86.5)	7 (6.3)	-	-
Pulotomy	87 (78.4)	16 (14.4)	-	-
Pulpectomy	93 (83.8)	9 (8.1)	1 (0.9)	-
Non-surgical extraction	100 (90.1)	3 (2.7)	-	-
Cementing space maintainer/regainer appliances	100 (90.1)	3 (2.7)	-	-

DISCUSSION

A study was conducted to determine various aspects of endodontic practice on Belgian dentists. Among these respondents, 95% of them were dental practitioners. The findings illustrated that, as compared to older practitioners, younger ones more frequently used of magnification tools in dental practices (Neukermans *et al.*, 2015). Another study aimed to determine the preference of endodontists and general dental practitioners (GDPs) in terms of endodontic treatment. Data was obtained, which was in relevance with the usage of magnifying loupes, microscopes, and the number of years they have served in dentistry as a dental practitioner. The results stated that, 87.5% of endodontists used surgical microscope in

dental procedures; whereas, only 6.2% of GDPs used of surgical microscope. However, 30.4% of them used magnifying loupes during endodontic treatment (Wong *et al.*, 2016).

Another research was taken into consideration with an aim to determine the impact of magnification tool and its association with operating microsurgery. The findings illustrated that, previously microscope was used for microsurgery but at present, magnification systems are very popular in dentistry. The study further highlighted about various magnification systems and their application in microsurgery (Mallikarjunet *al.*, 2015). According to a consultation with an ophthalmologist regarding magnification, it was revealed that the usage of magnifying loupes does not harm the eyes or weaken the vision, but in case of wearing magnifying loupes continuously, the user tends to become more detail oriented (Christensen, 2003).

Additionally, a study was conducted to examine the effects of magnification levels on the reliability and accuracy of visual caries detection. The assessment on occlusal surfaces of 100 extracted molars was done by 4th year dental students and dentists. The findings revealed that, with the increase in magnification; the number of surfaces decreased and the number of surfaces with breakdown increased as well as, the sensitivities increased (Neuhaus *et al.*, 2015). There are many new techniques that are being used for root canal treatment and for the enhancement in visualization of the surgical field. A study was conducted to evaluate the effects of endodontic treatment performed with the help of magnification devices. The magnifying tools used in endodontics included surgical microscope, magnifying loupes and endoscope. The results revealed that the usage of magnifying tools in endodontic treatment tends have more technical advantages for the patients; however, they should be systematically addressed during practices (Del Fabbro *et al.*, 2009).

A study determined different aspects of treatment of periodontal disease and mucogingival defects during therapeutic procedures. According to the findings, microsurgery and magnification aids were carried out with the combination of appropriate techniques, they tend to bring about more positive results in terms of suitable treatment and healing time (Sitbon, Attathom & St-Georges, 2014). Another study aimed to examine endodontic perspective to make proper clinical decisions regarding preservation and management of natural teeth. Results revealed that the usage of modern techniques and magnifying tools in endodontic practice tends to ensure the prevention and early identification of complications; such as perforations, root resorption and vertical root fractures (Rosen, Paul & Tsesis, 2017). The findings also revealed that the usage of magnification systems like surgical microscopes and dental loupes are beneficial in terms of its positive impact on the enhancement of vision for both laboratory and clinical procedures (Hegde & Hegde, 2016). Magnifications systems benefit visual acuity because of co-axial lighting, illuminations, unobstructed vision, smaller instruments, ergonomic benefits and minimal trauma.

CONCLUSIONS

In dentistry, magnification is considered as the greatest revolution of science. This revolution is responsible for the progression in the field of dentistry as well as medicine. Despite of the expenses, still there is an immense growth in

terms of magnification devices usage in different dental specialties. Furthermore, these tools are now becoming an integral part of dentistry mainly for operating microsurgery. The present study has determined different perspectives of dental professionals regarding the usage of magnification devices and their impact in the field of dentistry. The application of magnifying tool is only beneficial, when it is used with proper training and required skills.

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Conflict of Interest

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