

Characteristics and attitudes of general and pediatric dentists who use loupes

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Background: Dental loupes are used by dental professionals to improve visual performance, reduce eye strain and prevent musculoskeletal disorders. Data on their usage in pediatric dentistry are scarce. **Study design:** We performed a cross-sectional survey to evaluate the approach, knowledge, and frequency of using loupes among 100 general and pediatric dentists. **Results:** showed that the use of loupes is significantly more prevalent among general dentists (64.3%) compared to pediatric specialists and residents (35.7%). Among dentists who reported that they do not use loupes, 63.6% were pediatric dentists and residents, and 82.5% were dentists working with children. A significantly higher percentage of dentists who self-reported as loupes users perceived that the loupes afford comfortable and stable posture, confidence while working, and contribute to the detection of tooth decay. A significantly higher percentage of dentists who self-reported as non-users of loupes (compared to loupes users), claimed that they weaken the eyes, require long adjustment, and cause discomfort. **Conclusion:** Although the use of loupes in general dentistry is becoming more prevalent, there is still a need to raise awareness for this vision aid among pediatric dentists while promoting its advantages, to reap benefits associated with their usage.

Keywords: Pediatric dentistry, Loupes, Magnification, Accuracy, Caries detection

INTRODUCTION

Dentistry is a physically and visually demanding profession, requiring assessment and work on small structures. As a result, dental professionals often practice in unfavorable postural positions to get closer to the working field, and many of them suffer from musculoskeletal disorders^{1,2}. Dental loupes are special magnifying glasses that are used by many professionals, such as beauticians, surgeons, dentists, and ophthalmologists, as an aid for performing precise, and extremely delicate procedures.

Loupes and other magnification aids are recommended for dentists with both low and moderate visual acuity^{3,4}. As the quality of vision tends to decline with age, to compensate for individual or age-related visual limitations that might over time impair the quality of the dentistry work, the use of optical aids, such as loupes or microscopes, should be started at a relatively early stage⁵. Loupes also decrease eye strain, thus can lead to reduced fatigue⁶.

Improving the visibility of small details using loupes contributes to the detection of clinical errors, such as problems with marginal sealing, marginal leakage, and secondary caries⁷⁻⁹. Studies have shown that using loupes improved the quality of tooth preparation¹⁰⁻¹³.

The use of loupes also helps to improve dental practitioners' posture^{14,15} and prevent musculoskeletal disorders¹⁶.

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Data on the use of loupes in pediatric dentistry are scarce. Therefore, we aimed to characterize the use of loupes among pediatric dentists in comparison to general dentists and to evaluate the attitudes of dentists toward them.

MATERIALS AND METHOD

Study setting and participants

This cross-sectional survey was conducted including 50 pediatric dentists and residents and 50 general dentists and specialists in other dental fields. Participants were recruited by convenience sampling using questionnaires distributed in private dental clinics and at a conference held by the Israeli Society of Dentistry in Children. In addition, questionnaires were also disseminated online. All participants provided informed consent prior to completing the questionnaire. Dentists who had any vision disability or other diseases were excluded from the study.

Questionnaire

The questionnaire was based on a validated questionnaire used in a previous study¹⁷. The questionnaire was in Hebrew, and it included 20 items: demographic information such as age, gender, qualification (*i.e.*, general, or pediatric dentist or resident), the field of practice, seniority (*i.e.*, years in practice), location (of studies and of current practice), weekly work hours, and the number of children treated per day. In order to assess participants' knowledge and attitudes toward using loupes, they were requested to answer multiple-choice or "choose all that apply" questions (*e.g.*, "Identify all of the items that you consider benefits or disadvantages, the reason for using/not using loupes in the dental practice", "When were you introduced to loupes?", "Do you consider their use beneficial?", "Would you recommend their usage and in which area of dentistry?").

Statistical analysis

The main objective of the study was to examine the differences between physicians who use loupes and those who do not. To calculate the required sample size, the G-power software (SPSS Statistics for Windows, version 25 (SPSS Inc., Chicago, Ill., USA)) was used with the following assumptions: significance level (type 1 error, alpha) 5%, minimum test intensity 80%. A multivariate logistic regression model was used for calculating the differences between proportions (odds ratio = 2.0). Under these assumptions, the sample size required for a reliable statistical examination of the study objectives was 88 physicians.

Continuous variables were summarized using mean and standard deviation and categorical variables were summarized using numbers and percentages. Relationships between sample characteristics and positions regarding the use of loupes were assessed using Chi-Square tests with fisher correction. A multivariate model for predicting the use of loupes was evaluated using logistic regression. The level of significance was 5%. Data were analyzed using the SPSS software version 25.0 (IBM Corporation, Armonk, NY, USA).

RESULTS

Participant demographics and professional characteristics

A total of 100 dentists completed the questionnaire. The participants' demographic and professional characteristics are summarized in Table 1. Fifty participants were pediatric dentists (30 of them specialists and the rest were residents) and fifty participants were general dentists and specialists in various fields of dentistry. Most participants (76%) were over 30 years of age.

Over half of the participants studied dentistry in Israel (55.0%). Most (73.0%) had seniority of 7 years or more, and two-thirds (65.0%) reported working in a clinical setting. The main areas of practice were pediatric dentistry (63.0%) and a combination of several areas that do not include children (14.0%). Half of the participants (51.0%) reported practicing dentistry over 35 hours per week and 38.0% reported working 21–35 hours per week. The rest worked fewer hours per week. About a quarter of the participants (24.0%) reported treating an average of 11–15 children per day, about a third of the participants (35.0%) reported treating an average of 6–10 children per day, and 30% reported treating an average of 5 children or less per day.

Relationship between the use of dental loupes and the demographic and professional characteristics of dentists.

Among the demographic characteristics examined, a significantly higher percentage of male dentists reported using loupes compared to female dentists ($\chi^2(1) = 8.30, p < 0.01$). General dentists reported using loupes more than pediatric specialists and pediatric dentistry residents ($\chi^2(2) = 8.79, p = 0.01$). Moreover, a statistically significant smaller percentage of participants who treat children reported using loupes ($\chi^2(1) = 11.22, p < 0.01$).

A multivariable regression analysis including age, professional seniority, combining clinical and academic work, location of dentistry studies, number of work hours per week and the number of children treated per day found that none of these variables were associated with the use of loupes (Table 2).

Relationship between the use of loupes and attitudes towards the use of loupes.

As shown in Table 3, most participants reported that they started using loupes during their dentistry studies. A significantly higher percentage of participants working in private clinics reported using loupes compared with those working in an academic setting ($\chi^2(1) = 26.66, p < 0.01$). Most of the participants who reported not using loupes (71.1%) recommend using them depending on the case at hand. Among those using loupes, 46.3% believe that they are a necessary and important tool and over half of them (53.7%) recommend their usage on a case-by-case basis. Furthermore, a higher percentage of participants who use loupes believe that they are helpful compared to those who do not use loupes (97.6% vs. 57.1%; $\chi^2(1) = 18.20, p < 0.01$) and believe that the loupes help in treating children (58.1% vs. 5.3%; $\chi^2(1) = 34.7, p < 0.01$).

Relationship between the use of loupes and the benefits of using loupes

As shown in Table 4, a statistically significantly higher percentage of participants who reported using loupes compared to those who reported not using them perceived that the loupes allow a comfortable and stable posture ($\chi^2(1) = 8.35, p < 0.01$), higher quality of work ($\chi^2(1) = 5.51, p = 0.02$), confidence at work ($\chi^2(1) = 9.79, p < 0.01$), increased accuracy ($\chi^2(1) = 7.77, p < 0.01$), and contribute to the detection of tooth decay ($\chi^2(1) = 4.09, p = 0.04$), (Table 4). There was also a trend for a statistically significant difference between participants who reported using loupes and claimed that the loupes contribute to better radiographic evaluation and participants who reported not using them ($\chi^2(1) = 3.30, p = 0.07$).

Relationship between the use of loupes and the disadvantages of using loupes

As shown in Table 5, a statistically significantly higher percentage of participants who reported that they do not use loupes, compared to those who reported using them, claimed that they weaken the eyes ($\chi^2(1) = 5.40, p = 0.02$), require a long adjustment time ($\chi^2(1) = 6.12, p = 0.01$), cause discomfort ($\chi^2(1) = 12.56, p < 0.01$) and are costly ($\chi^2(1) = 4.70, p = 0.03$). The percentage of other disadvantages of loupes, such as causing fatigue and headaches, making the dentist appear frightening to patients, limited field of view and reduced sense of touch were not statistically significantly different between dentists who self-reported using loupes and non-users.

Association between use of loupes and areas in dentistry where loupes could be helpful

As shown in Table 6, a statistically significantly higher percentage of participants who reported using loupes believed that loupes would be helpful in endodontics ($\chi^2(1) = 8.29, p < 0.01$) and orthodontics ($\chi^2(1) = 9.68, p < 0.01$). There was also a trend for a statistically significant difference in the percentage of participants who reported using loupes and believed that loupes would benefit the fields of pediatric dentistry ($\chi^2(1) = 3.27, p = 0.07$), periodontics ($\chi^2(1) = 3.76, p = 0.05$), as well as the control and monitoring of treatments ($\chi^2(1) = 2.98, p = 0.08$) compared to those who reported not using loupes.

DISCUSSION

Our findings showed that the use of loupes is more prevalent among general dentists (64.3%) compared to pediatric specialists and residents (35.7%). In terms of the benefits of using loupes, more participants who reported using loupes than those who did not, agreed that their use contributes to comfortable and stable posture, better detection of caries, higher quality of work, more confidence at work, increased accuracy, and better radiographic assessment ability. According to James and Gilmour, the significant benefits of using loupes in operative dentistry were improved visibility of small details, compensation for presbyopia, and ensuring proper posture⁷.

Studies on the use of loupes among pediatric dentists are lacking. Our findings showed that among the dentists who

Table 1: Participants' demographic and professional characteristics.

Parameter	Study population n (%)
Age (years)	
25–30	24 (24.0)
31–40	41 (41.0)
>40	35 (35.0)
Gender	
Men	44 (44.0)
Women	56 (56.0)
Qualification	
General dentist	47 (47.0)
Pediatric dentistry specialist	30 (30.0)
Pediatric dentistry resident	20 (20.0)
Resident in other dentistry fields	3 (3.0)
Main field of practice	
Surgery	5 (5.0)
Pediatrics	63 (63.0)
Orthodontics	2 (2.0)
Root canals	2 (2.0)
Rehabilitation	8 (8.0)
Combination of several areas that do not include children	14 (14.0)
Combination of several areas that include children	6 (6.0)
Professional seniority	
0–3	11 (11.0)
3–6	16 (16.0)
7–10	32 (32.0)
>11	41 (41.0)
Job setting	
Private clinic	65 (65.0)
Academic clinic	3 (3.0)
Private and academic	32 (32.0)
Dentistry studies location	
Israel	55 (55%)
Abroad	45 (45%)
Weekly hours in dentistry	
<10	4 (4.0)
10–20	7 (7.0)
21–35	38 (38.0)
>35	51 (51.0)
Number of children per day	
0	16 (16.0)
1–5	14 (14.0)
6–10	35 (35.0)
11–15	24 (25.0)
>16	11 (11.0)

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Table 2: Relationship between the use of dental loupes and the demographic and professional characteristics of dentists.

Parameter	Does not use loupes n (%)	Uses loupes n (%)	χ^2	<i>p</i>
Age, years				
25–30	11 (19.3)	13 (30.2)	2.64	0.27
31–40	27 (47.4)	14 (32.6)		
>40	19 (33.3)	16 (37.2)		
Gender				
Women	39 (68.4)	17 (39.5)	8.30	<0.01
Men	18 (31.6)	26 (60.5)		
Qualification				
General dentist	20 (36.4)	27 (64.3)	8.79	0.01
Pediatric dentistry specialist	16 (29.1)	4 (9.5)		
Pediatric dentistry resident	19 (34.5)	11 (26.2)		
Practice with children	47 (82.5)	22 (51.2)	11.22	<0.01
Professional seniority, years				
0–3	6 (10.5)	5 (11.6)	4.62	0.20
3–6	7 (12.3)	9 (20.9)		
7–10	23 (40.4)	9 (20.9)		
>11	21 (36.8)	20 (46.5)		
Works in an academic and private clinics	18 (31.6)	14 (32.6)	0.01	0.92
Location of academic studies				
Israel	34 (59.7)	21 (48.9)	1.60	0.45
Abroad	23 (40.4)	22 (51.2)		
Weekly hours in dentistry				
<10	7 (12.3)	4 (9.3)	0.73	0.69
21–35	23 (40.4)	15 (34.9)		
>35	27 (47.4)	24 (55.8)		
Number of children per day				
0	5 (8.8)	8 (18.6)	9.28	0.05
1–5	6 (10.5)	14 (32.6)		
6–10	21 (36.8)	8 (18.6)		
11–15	16 (28.1)	2 (4.7)		
>16	9 (15.8)	11 (25.6)		

reported that they do not use loupes, 63.6% were pediatric dentists and residents, and 82.5% were dentists working with children. Possibly less pediatric dentists choose to use loupes because their appearance wearing loupes might have on their pediatric patients. Moreover, compared to general dentists or other specialists, their appearance wearing loupes during treatment might hinder their attempts of effective contact and good rapport, marked by confidence and trust in a relaxed and safe atmosphere. Nevertheless, loupes may be especially useful to pediatric dentists because their magnification allows better visualization of the small dimensions of primary tooth structures. Additionally, as dental treatment of children, especially young ones, should be carried out quickly, improved visualization of the oral structures enables dentists to work faster while maintaining high-quality treatment.

Most participants who reported using loupes also reported working in a private dental clinic (92.7%) compared with 72.2% of participants who reported not using loupes and working in an academic clinic. The use of dental loupes in private clinics may indicate to patients that the dentist uses state-of-the-art technology and works precisely and accurately.

The prevalence of loupes use in dentistry varies widely by country. In a study conducted among 370 dental practitioners

in the state of Andhra Pradesh, India, only 23.8% reported using loupes, although over 90% were aware of the use of loupes in modern dentistry¹⁸. In a study conducted among 400 dentists and dental students in Saudi Arabia, only 12.25% reported using dental loupes in their clinical practice¹⁹, while in another study in Saudi Arabia the prevalence of loupes uses among dental professionals—most of them general dentists—was 32.4%²⁰. In a study conducted among dentists working in private clinics in Switzerland, 64% reported owning dental loupes⁵, while in a study conducted in the United Kingdom, the prevalence of loupes use among general dentists was 44%²¹.

A significantly higher percentage of dentists (84.2%) who started using loupes when they were students, did not continue using them in their clinic, compared to dentists (62.5%) who started using loupes during their studies and continued using them afterward. Despite the benefits of loupes, not everyone who uses them adapts well²² and wants to continue using them or feels that they benefit their work. Maggio *et al.*²³ reported that the use of loupes by dental students during their studies was an important tool that significantly improved the performance and level of clinical work. In a qualitative study among 24 dental students, they reported that magnification us-

Table 3: Relationship between the use of loupes and attitudes towards loupes.

Parameter	Does not use loupes n (%)	Uses loupes n (%)	χ^2	p value
Job setting				
Private clinic	5 (27.8)	38 (92.7)	26.66	<0.01
Academic clinic	13 (72.2)	3 (7.5)		
Recommends using loupes				
Yes, as a necessary and important tool	2 (4.4)	19 (46.3)	26.48	<0.01
Yes, depending on the case	32 (71.1)	22 (53.7)		
No	2 (24.4)	0 (0)		
Started using loupes				
Studies	32 (84.2)	25 (62.5)	4.67	0.03
When began working	6 (15.8)	15 (37.5)		
Using loupes helps	16 (57.1)	41 (97.6)	18.2	<0.01
Member of the Association of Dentists	33 (58.9)	16 (37.2)		
Loupes magnification				
2–2.5	9 (75.0)	18 (41.9)	4.14	0.13
2.5–3	2 (16.7)	18 (42.9)		
>3	1 (8.3)	7 (16.3)		
Reason for not using loupes				
Difficulty adjusting	12 (31.6)	5 (55.6)	3.29	0.19
Difficulty when working with children	17 (44.7)	4 (44.4)		
Price	9 (23.7)	0 (0)	34.67	<0.01
Using loupes helps in treating children	3 (5.3)	25 (58.1)		

Table 4: Relationship between the use of loupes and the benefits of using loupes.

Benefit	Does not use loupes n (%)	Uses loupes n (%)	χ^2	p value
Comfortable and stable posture	26 (45.6)	32 (74.4)	8.35	<0.01
Locating caries	19 (33.3)	23 (53.5)		
High quality of work	39 (68.4)	38 (88.4)	5.51	0.02
Evaluation of radiographic photographs	3 (5.3)	7 (16.3)		
Scaling	5 (8.8)	8 (18.6)	2.09	0.15
Confidence at work	10 (17.5)	20 (46.5)		
Increased accuracy	38 (66.7)	39 (90.7)	7.77	<0.01
Caries detection	18 (31.6)	17 (39.5)		

ing loupes led to an improvement in their work postures, hand skills, and quality of dental procedures. However, an adjustment period was needed⁴.

A dentist who is aware of the importance and benefits of using loupes will use them more often. Aldosari reported that the use of loupes improves the therapist’s visual acuity and thus contributes to achieving better diagnosis and treatment²⁴. In contrast, a dentist who is aware of the shortcomings of the loupes or thinks that they do not improve his work refrains altogether or uses them only in isolated cases. In the current study, more dentists who did not use loupes than those who did claim that using them entails a long adjustment period, weakening of the eyes, and discomfort. Loupes’ high price was also considered a disadvantage by more participants who did not use loupes. Price was a limiting factor to purchasing loupes in other studies as well^{18–21}, while Basunbul found that the importance of magnification was a consideration, before

price²⁰.

More participants who used loupes, compared to those who did not, stated that their use may be beneficial in endodontics, orthodontics, periodontics, and pediatric dentistry, partially corresponding to Low et al. who indeed found most loupes users were general dentists and endodontists²⁵. In endodontic treatments, the use of loupes by dentists helped improve the detection of root canals, diagnosis of fractures, and correct perforations²⁶. Aldosari reported that the success rate of endodontic surgery performed with loupes, or a microscope was higher than treatment without a magnification device²⁴. Wong et al.¹³ found that performing root canal treatment in primary teeth with loupes significantly shortened treatment time compared to performing the same procedure without loupes. The use of loupes for orthodontic debonding allows less damage to the enamel and less composite residue²⁷.

The limitations of the study include its sampling method;

Table 5: Relationship between the use of loupes and the disadvantages of using loupes.

Disadvantage	Does not use loupes n (%)		Uses loupes n (%)		χ^2	<i>p</i> value
Long adjustment time	38	(66.7)	18	(41.9)	6.12	0.01
Weakening eyes	16	(28.1)	4	(9.3)	5.40	0.02
Fatigue and headaches	20	(35.1)	11	(25.6)	1.04	0.31
Frightening appearance to patients	29	(50.9)	15	(34.9)	2.54	0.11
High price	22	(38.6)	26	(60.5)	4.70	0.03
Danger of infection	3	(5.3)	0	(0)	2.33	0.26
Using large magnifications	3	(5.3)	1	(2.3)	0.55	0.63
Limited field of view	31	(54.4)	19	(44.2)	1.02	0.31
Discomfort	32	(56.1)	9	(20.9)	12.56	<0.01
Reduced sense of touch	10	(17.5)	5	(11.6)	0.67	0.41

Table 6: The relationships between the use of loupes and areas in dentistry where the use of loupes could be useful.

Dentistry area	Does not use loupes n (%)		Uses loupes n (%)		χ^2	<i>p</i> value
General examination and diagnosis	21	(36.8)	21	(48.8)	1.45	0.23
Control and monitoring	9	(15.8)	13	(30.2)	2.98	0.08
Work on crowns and bridges	29	(50.9)	29	(67.4)	2.76	0.10
endodontics	34	(59.6)	37	(86.0)	8.29	<0.01
rehabilitation	32	(56.1)	30	(69.8)	1.93	0.16
Surgical procedures	25	(43.9)	23	(53.5)	0.91	0.34
periodontics	17	(29.8)	21	(48.8)	3.76	0.05
Pediatric dentistry	13	(22.8)	17	(39.5)	3.27	0.07
orthodontics	3	(5.3)	12	(27.9)	9.86	<0.01

some of the study population was recruited at a professional dentistry conference, private clinics, and online via email. Hence, our findings might not be representative of the general population of dentists. In addition, we have no information on the rate of non-responders.

CONCLUSIONS

Among general dentists, there is a higher prevalence of loupes usage, stemming from their higher awareness, compared to pediatric specialists and residents. Moreover, we found low rates of loupes usage among pediatric dentists and dentists who treat children. Therefore, there is still a need to raise awareness for using loupes among pediatric dentists, and to promote their advantages to reap benefits associated with their usage. Although the use of loupes in general dentistry is becoming more prevalent, further studies on their use in pediatric dentistry are warranted.

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CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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INSTITUTIONAL REVIEW BOARD STATEMENT

The study was conducted in accordance with the Declaration of Helsinki, and approved by the Institutional Ethics Committee of Tel Aviv University.

INFORMED CONSENT STATEMENT

Informed consent was obtained from all subjects involved in the study.

DATA AVAILABILITY STATEMENT

The data presented in this study are available on request from the corresponding author. The data are not publicly available due to confidentiality issues.

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