

EYE SAFETY IN DENTISTRY — A STUDY

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ABSTRACT

The aim of this study was to determine the use of eye protection by dental staff and patients as well as to highlight the significance of eye protection in dental practice setting, with regard to adequate protection and its use at appropriate times. This study was conducted at Royal Medical Services affiliated hospitals in Jordan from January 2008 to December 2008. Questionnaires were sent to 100 dentists (with different specialties), chosen at random, to update the information on the eye protection, the preferred methods of eye protection and any experience of ocular injury. The patients data and information were collected from the patients who filled the proforma during their visits to dental clinics.

Four hundred patients were included in the study, 60% were males and 40% females, with age range 5-85 years. 30% of the adults and 20% children used eye protection. Eighty per cent of dentists wore eye protection routinely, but their choice of protection was not always adequate and not worn for all procedures. Sixty percent of dentists had experience of ocular trauma or infection which occurred during variety of procedures; 73% of these injuries resulted from not wearing eye protection. In contrast less than one third of the dental nurses (DNs) used protection routinely, particularly when cleaning contaminated instruments. However, hygienists did wear eye protection for the majority of their patient work (95%).

It was concluded that eye protection use by all dental staff and patients was below the recommended guidelines. Risks encountered within the dental environment do cause harm to the unprotected eye which can be greatly reduced or even eliminated by improving the uptake of suitable eye protection. Several choices for eye protection are available. Each individual dentist is responsible for the uptake of eye protection for all persons in their dental procedure environment.

Key words: Eye protection, Dentists, infection control, Safety glasses.

INTRODUCTION

Till 1970s, many dentists performed dental procedures with no or little knowledge of personal protection. The perceived risk of infection was thought to be low and few dentists wore operating gloves, masks or eye protection. The increasing awareness of personal protection and cross infection control, from both dental professionals and patients has changed this perception. While the use of protective gloves and masks by all the dentists appears now to be a routine behavior, still eye protection is not of great concern.

Ocular injuries during dental practice may have serious and long term effect and sometimes lead to loss of vision in one or both eyes. Symptoms of direct mechanical trauma often correlate with severity and type of trauma, and include pain, epiphora, and blurring of vision. Table 1 shows the ocular adverse effects that harm both the dentists and the patients along with their symptoms.

Penetrating ocular trauma might lead to serious complications and require extensive surgery. Chemical injuries can result in corneal damage and lead to visual impairment and discomfort, which may limit a dentist's future clinical practice. In minor trauma, generally the eye heals well and rarely are there any long term complications, with the exception of recurrent erosion syndrome which needs long term treatment with lubricants and mild steroids.

Contamination of the eye with bodily fluid accidentally such as blood and saliva carries with it several potential risks, both bacterial and viral¹ (Table 1). Previous studies emphasize that eye infection were common among dentists and although many were concerned, few were using proper eye protection^{2,3}. Since the surface of the eye is a vital structure, simple contact with an infected substance, for example from a contaminated aerosol, has the potential to cause infec-

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tion, without the need to be abraded or breached.^{4,5} More recently, concern has been raised about infections caused by methicillin resistant staphylococcus aureus (MRSA). This can be spread by direct contact and although not normally found within the oral cavity, it is found in nostrils. In addition it has been occasionally isolated from oral infections.⁴ It must be emphasized that most carriers of latent infection are unaware of their condition and it is important that the same infection control routine is adopted for all patients; surgeons are more likely to use adequately protection, if a patient is known to be infected.^{4,6}

A standard dental light curing unit emits blue light between 350-500 nm, which includes UV group C, which is harmful for the eye indicating the necessity for filtration to protect the eye. Protection against UV and blue light should be incorporated in safety glasses to prevent acute and chronic changes in ocular structures, such as UV cataracts, solar retinitis, corneal and conjunctiva dystrophies and macular degeneration, which may lead to irreversible damage.⁷

Since tinted lenses used by the clinical team would hinder clinical practice if worn at all times, additional methods must be adopted, such as the use of wide orange filtration paddles when a dental light curing unit is in operation.⁸⁻¹⁰ Patients must be provided with shaded or color tinted glasses for optimal protection. Suitable eye protection against electromagnetic radiation must be considered to avoid irreversible damage. More recent dental light sources, such as the light emitting diode, and laser curing lights, not only require eye protection against the intense light but also the associated increased temperature.¹¹⁻¹⁴

The American Dental Association (ADA) has published following Guidelines for Infection Control in Dental Health – Care Setting 2003¹⁵;

"Protective eyewear with solid side shields or a face shield should be worn by dental health care personnel during procedures and patient-care activities likely to generate splashes or sprays of blood or body fluids. Protective eyewear for patients shields their eyes from spatter or debris generated during dental procedures."

METHODOLOGY

Questionnaires were sent to 100 dentists of all dental subspecialties and general dentists in the royal medical services hospitals in 2008. They were chosen at random from all military hospitals in Jordan. The questionnaire was sent with an explanatory letter and phone call to every dentist who participated in this study; dentists were asked to respond on behalf of themselves and their patients. It contained questions about the use of eye protection, types of glasses used,

how frequent they use the eye protection, in which procedures the eye protection is used and any ocular trauma occurred because of inadequate eye protection during his practice. All questionnaires were collected personally from dentists.

RESULTS

The results were according to each group in which eye protection is required and the ocular complications which occurred resulting from inadequate eye protection.

Dentists

All questionnaires (100) were collected from the dentists personally. 60% were male and 40% were female. Ninety five percent of dentists said that they were aware of the need for eye protection, although compliance with their own policies concerning eye protection was less than optimal. (Table 3). Eighty percent of dentists used some form of eye protection routinely; 55% of these were male and 35% female. Personal glasses were most popular with dentists (60%), but to those dentists using personal glasses as protective eye wear, only 20% had additional side shields attached.

Nineteen per cent stated they had 100% UV protection with their glasses and 60% had a scratch resistant coating in place. Twenty five per cent of dentists used loupes, and 60% of these said they used eye protection concurrently. Table 4 shows the preferences in protection for the dentists. Of the dentists using eye protection, it was most often used during restorative procedures (95%), scaling and polishing (90%) and extractions (80%), with only 50% wearing them for examinations alone (Table 5).

Dental Care Professionals

Less than third of DNs (28%), were reported the use eye protection regularly and 35% wore it occasionally. Those hygienists who wore eye protection did so routinely. DNs tended to wear eye protection for those procedures assumed to be high risk, e.g. restoration and scale and polish, which also reflects the dentists' practice. Hygienists wore eye protection for the majority of their work (95%), but only 15% used any protection when carrying out examinations (Table 5).

When cleaning instruments and disposing of contaminated equipment; 50% of dentists, 30% of DNs and 35% of hygienists wore eye protection (Table 5).

Patients

The results were surprising, Thirty per cent of adult patients and 20% of child patients were reported to have been using eye protection. The majority of

TABLE 1: POSSIBLE ADVERSE EFFECTS ON THE EYES

Infective/trauma	Effect	Cause	Symptom	Treatment	Outcome
Trauma	Corneal abrasion	Foreign body	Acute pain	Self limiting	Heals rapidly Recurrent erosion syndrome 2nd infection
	Hemorrhage in the anterior chamber Torn iris	Penetrating foreign body	Acute pain, altered vision, altered shape	Remove foreign body	Cataract, glaucoma, distorted pupil, retinal detachment, uveitis
	Laceration	Blunt/sharp object	Laceration and may involve the lid margin	Anatomical repair	Scarring and lid deformity
	Chemical injury	Acid/alkali	Mild conjunctivitis, epithelial erosion, keratopathy	Copious irrigation remove particles, topical antibiotics and steroids, vit c, lubricants	Usually recovered, corneal opacities, perforation, adhesion
Infective	Bacterial conjunctivitis	Staph, strep pneumonia haemophilus	Redness, discharge, ocular irritation	Usually self limiting	Heals
	Bacterial keratitis	Staph, epidermides, aureus, Strep pneumonia, Pseudomonas haemophilus	Pain, purulent discharge Ciliary infection Visual impairment, Corneal opacity	Topical antibiotics	Heals
	Viral conjunctivitis	Adeno virus, Coxsacki picornavirus	Watery purulent discharge, chemosis, excess lacrimation	Self limiting but highly infective	Heals
	Viral keratitis	Herpes simplex	Dendritic ulcer in the cornea and may involve the stroma	Acyclovir	Ulcer heals without scarring Risk of permanent scarring and blindness
	Hepatitis B and C HIV	Hepatitis virus HIV	Systemic infection Systemic infection	Interferon Supportive drug treatment	Chronic infection, cirrhosis, cancer Poor prognosis and death

patients wore safety glasses compared to personal glasses, as shown in Table 6. In general, patients used eye protection in all treatment circumstances, with the percentage of use weighted towards those procedures believed to be of increased risk to the unprotected eye.

Seventy per cent of the dentists said they would continue to treat a patient if he/she declined to wear any eye protection; 10% gave no response, and only

20% stated they would refuse to continue with the scheduled treatment.

Adverse events

Almost two thirds of the 100 dentists (60%) had experience of incidents regarding injury to the eye, with 80% of these episodes involving the dentists themselves (Table 7). More than two third of these dentists (73%) had no staff policy and 70% required hospital treatment. Overall, 73% of such injuries re-

sulted from no eye protection being worn, while 27% occurred with inadequate eye protection. Fifteen per cent of incidents involved patients. (The patients data and information were collected from the

patients at the time of their visits), 5% involved DNs, but only one hygienist was reported to have experienced harm to the eye in this study. Of the reported episodes 70% required hospital treatment, and the remainder (30%) were managed by the injured party themselves.

TABLE 2: COMPLIANCE WITH DENTAL POLICY

Staff	30%
Patients	20%

TABLE 3: TYPES OF PREFERRED EYE PROTECTION

Wearing eye protection	Personal glasses	Visors	Safety glasses
Dentists (80%)	60%	20%	20%
Dental nurses (28%)	35%	46%	19%
Hygienist (75%)	40%	35%	25%

DISCUSSION

The 100% response rate was beyond our expectation which can be explained by the personal distribution and collection of the questionnaire and due to the phone calls made to all dentists who replied it. Dentists responding on behalf of their patients and with the responsibility for obtaining the information from their auxiliary staff does introduce a factor of reliability to the results, which must be considered when discussing the findings.

The ADA and the BDA recommend wearing visors, manufactured safety glasses or personal glasses with additional side shields. Visors and safety glasses are

TABLE 4: DENTAL PROCEDURES WHEN EYE PROTECTION WAS WORN

Procedure	Examination	Fillings	Scale and polish	Extractions	Root canal treatment	Denture work	Instrument cleaning
Dentists	60%	90%	90%	80%	85%	60%	50%
Dental nurses	10%	80%	80%	60%	55%	5%	30%
Hygienists	15%		95%				35%
Patients	20%	65%	75%	40%	75%	20%	

TABLE 5: PATIENT EYE PROTECTION

Patients	Not using eye protection	Percentage using eye protection	Percentage of type of eye protection used	
			Personal glasses	safety glasses
Adults	70%	30%	18%	82%
Children	80%	20%	8%	92%

TABLE 6: VARIABLES IN ADVERSE EVENTS

Variables	Percentage of adverse events		
	Dentists (80%)	Dental Nurses (5%)	Patients (15%)
With protection	35%	17%	0%
Without protection	65%	83%	100%
Female	20%		
Male	80%		
Hospital treatment	70%	40%	35%
Self treatment	30%	60%	65%
No staff policy	70%		
No patient policy	55%		

TABLE 7: TYPES OF EYE PROTECTION

Type	Advantaged	Disadvantages
Safety glasses	Good dimensions with side shields Tinted lenses adequate filtration Cost effective Child sizes available Can be used with loupes Protect against vapour	Optically imperfect Tinted lenses Tinted lenses Clear lenses – inadequate filtration of UV light, additional protection required
Visors	Less claustrophobic to protect face from clear protection Face more visible to patients Shields easily replaced Cost effective	Optically imperfect Need for additional UV protection Not suitable for patients Must be adjusted to use with loupes
Personal glasses	Need for vision correction optically perfect Slide shields can be added Convenient for patients Can be used with loupes	Unsuitable dimensions for adequate protection Need for additional UV protection

made of polycarbonate which is optically imperfect, and although causing no permanent damage it may be an inconvenience when carrying out work with defined precision. Table 8 shows the advantages and disadvantages of the various types of eye protection.^{2,16,17} The use of personal glasses may be a suitable means of protection for clinical staff and patients.⁴ Personal glasses should have an adequate frame diameter to shield the ocular area, and preferably should have additional side shields; suitable UV protection is required. However, modern prescription glasses are becoming increasingly small and narrow making them unsuitable for the use of eye protection. It is, therefore, up to the dentists to judge whether the patient's or indeed their own, glasses will offer adequate protection, and if not, provide adequate protection. Most, but not all, the dentists were aware of the need for eye protection. The present study confirmed earlier studies that found total compliance with eye protection guidelines to be less than 100%.¹⁸⁻²¹ The routine use of eye protection by dentists in this study was dependent on the procedure; those tasks associated with greater risk to an unprotected eye such as carrying out a filling, had the best compliance. Females are generally more health conscious than males which is reflected in these results concluding that 90% of female dentists who responded were using eye protection routinely, compared with 80% of males; this too is reflected in the incidents reported with 80% of dentists involved were male. Of the injuries involving dentists, twice as many occurred without eye protection than with what can be assumed inadequate eye protection. The severity of the eye injuries could be reflected in the fact that more than two thirds of dentists required hospital treat-

ment. It is also recommended that patients wear eye protection for all treatment modalities, particularly when in supine as the risk of injury is increased.^{4,21,22} However, this study demonstrated that eye protection was not used routinely with both adult and child patients, and it is at these times eye injuries occur. Almost all the adult and child patients who did wear eye protection were provided with safety glasses. Eye protection does prevent injury, but needs to be worn all the times during exposure prone procedures to ultimately reduce the risks, since injuries were recorded during all of the procedures questioned. The only time eye protection is not imperative for staff is during a basic oral examination. Patient and staff cooperation requires implementation of the practice policy through good communication and clear explanations as to why eye protection is required.^{4,23} The public generally welcomes and accepts the use of barrier protection by dentists, if educated in its advantages and necessity.^{24,25}

Alarming, less than one third of the DNs (28%) in this study were reported to be using suitable eye protection routinely, the majority wore visors. It appeared from the results that DNs wore eye protection during operative procedures. Although 95% of hygienists wore eye protection when scaling and polishing, only 75% of them used eye protection for all procedures. Visors and personal glasses were more popular than safety glasses.

The study raised concern that the general lack of eye protection being worn when cleaning contaminated instruments with only 30% of DNs and 35% of hygienists doing so. Surface and instrument cleaning

and disinfecting are associated with a high risk of potential injury, and all personal protection is strongly advocated by the BDA and ADA^{3,4}. The instruments are contaminated with saliva and often blood, which increases the risks of a blood borne infection while handling these instruments during the cleaning process. A chemical injury to the eye resulting from the detergents used in surface disinfecting is also a concern. This emphasizes the need for further education and reinforcement for all staff by dentists who are ultimately responsible for the implementation of practice policy.

There are many factors influencing the dentist's choice of eye protection. Visual clarity is the most important one³. This is demonstrated in this study by 60% of dentists choosing their personal glasses for eye protection, however, only 20% of these had additional side shields, which provide the recommended level of protection. As people age, their need to wear prescription glasses will increase because of presbiopia; this may be a contributory factor in the number of dentists using personal glasses as eye protection.

Twenty per cent of the dentists in this study used loupes and the majority used their chosen form of eye protection simultaneously. Loupes are generally provided with adequate protective glasses, but it is also possible to wear visors over loupes, and if prescription lenses are required, these can be incorporated into the loupes. Integral eye protection and the improved posture common when using loupes, which increases the distance between the operative field and the eye, will also reduce the risk of ocular injury.

Although a low level of work related incidents involve the eye, this study and that of other authors have highlighted the eye as a vulnerable target, especially with prolonged exposure.^{17,18,26} This study emphasizes the need for appropriate eye protection in the general and all dental subspecialties practice setting during at risk procedures and is something which should be expected from the whole dental team; with effective communication and education of patients, this should result in 100% compliance by all.

REFERENCES

- 1 Jack J. Kanski. Clinical Ophthalmology: a Systematic Approach 5th Ed. UK: Butterworth-Heinemann, 2007.
- 2 Stokes AN, Burton JF, Beale RR. Eye protection in dental practice. *NZ Dent J* 1990; 86: 14-15.
- 3 Lonnoth EC, Shahnavaz H. Users' demands regarding dental safety glasses. Combining a quantitative approach and grounded theory for the data analysis. *Int J Occupational Safety & Ergonomics* 2001; 7: 49-59.

- 4 *Infection control in dentistry*. BDA Advice Sheet A12. Feb 2003. www.bda-dentistry. Org.uk/advice.
- 5 Schnetler JF. Blood splashes to the eyes in oral and maxillofacial surgery, and the risks of HIV transmission. *Br J Oral Maxillofac Surg* 1991; 29: 338-40.
- 6 Pigadas N, Avery CM. Precautions against cross infection during operations for maxillofacial trauma. *Br J Oral Maxillofac Surg* 2000; 38: 110-13.
- 7 Reme C, Reinboth J, Clausen M, Hafezi F. Light damage revisited: converging evidence, diverging views? *Graefes Archive for Clinical & Experimental Ophthalmology* 1996; 234: 2-11.
- 8 Teichman JM, Vassar GJ, Yates JT, et al. Color vision deficits and laser eyewear protection for soft tissue laser applications. *J Urol* 1999; 161: 874-80.
- 9 Berry EA III, Pitts DG, Francisco PR, von der Lehr WN. A evaluation of lenses designed to clock light emitted by light-curing units. *J Am Dent Assoc* 1986; 112: 70-72.
- 10 Sims AP, Roberts-Harry TJ, Roberts-Harry DP. The incidence and prevention of ocular injuries in orthodontic practice. *Br J Orthodontics* 1993; 20: 339-43.
- 11 Walsh LJ. The current status of laser applications in dentistry. *Aus Dent J* 2003; 48: 146-55.
- 12 Burgess JO, Walker RS, Proche CJ, Rappold AJ. Light curing – an update. *Compendium of Continuing Education in Dentistry* 2002; 23: 889-892, 894, 896.
- 13 Ries WR, Clymer MA, Reinisch L. Laser safety features of eye shields. *Lasers in Surg & Med* 1996; 18: 309-15.
- 14 Russell SW, Dinehart SM, Davies I, Flocks ST. Efficacy of corneal eye shields in protecting patients' eye from laser irradiation. *Dermatologic Surg*. 1996; 22: 613-16.
- 15 General Dental Council. *Maintaining standards*. Nov 1997, amended May 2001.
- 16 Lonnoth EC, Shahnavaz H Adverse health reactions in skin, eyes, and respiratory tract among dental personnel in Sweden. *Swed Dent J* 1998; 22: 33-45.
- 17 Lonnoth EC, Shahnavaz H. Use of polymer materials in dental clinics, case study. *Swed Dent J* 1997; 21: 149-59.
- 18 Al Wazzan KA, Almas K, Al Quahtani MQ, Al Shethri SE, Khan N. Prevalence of ocular injuries, conjunctivitis and use of eye protection among dental personnel in Riyadh. *Int Dent J* 2001; 51: 89-94.
- 19 Sofola OO, Savage KO. Assessment of the compliance of Nigerian dentists with infection control: a preliminary study. *Infection Control & Hospital Epidemiology* 2003; 24: 737-40.
- 20 Porter SR, El-Maaytah M, Alfonso W *et al*. Cross infection compliance of UK dental staff and students. *Oral Diseases* 1995; 1: 198-200.
- 21 Pacak-Carroll D. Remember eye protection is necessary for patients too, *RDH* 1992; 12: 14.
- 22 Riskwise UK. *Tales of the unexpected – the orbit*. London: Dental Protection Ltd, 2003.
- 23 Lipscomb HJ. Effectiveness of interventions to prevent work related eye injuries. *Am J Preventive Med* 2000; 18: 27-32.
- 24 Grace EG, Cohen LA, Ward MA. Patient's perceptions related to the use of infection control procedures. *Clin Preventive Dent* 1991; 13: 30-33.
- 25 Shulman ER, Brehm WT. Dental clinical attire and infection control procedures. Patients' attitudes. *J Am Dent Assoc* 2001; 132: 508-16.
- 26 Allsopp J, Basu MK, Browne RM *et al*. Survey of the use of personal protective equipment and prevalence of work related symptoms among dental staff. *Occupational & Environmental Medicine* 1997; 54: 125-34.