

**UV EXPOSURE THROUGH AND AROUND DRESS EYEWEAR
IN THE GENERAL POPULATION**

by

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and

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Has been approved

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Doctor of Optometry Senior Paper
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ABSTRACT

Background: This research study explores the awareness level and past education of optometric patients about ultraviolet radiation (UVR) exposure through, above or around spectacles, and their use of protective measures. It also quantifies the exposure level of study participants' spectacles.

Methods: Sixty-nine optometry clinic patients (at the University Eye Center of the Michigan College of Optometry (MCO) at Ferris State University (FSU)) were randomly surveyed with a short questionnaire, and their spectacles were evaluated for UV transmittance and exposure angle.

Results: Through the analysis of the survey data, a majority of patients reported not receiving specific or detailed education about UV exposure and protection, and also did not wear additional protection for such exposure. However, the majority of spectacle wearers did have UV protection in their lenses.

Conclusions: Additional education should/must be given by Eyecare professionals to patients concerning UV exposure and prevention, especially to patients at higher risk of harmful effects. Although, with the standard materials used today in spectacle lenses, significant UV protection is inherent.

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INTRODUCTION

It is well known that ultraviolet radiation (UVR) can cause damage to ocular structures, as well as skin surrounding the eyes and face (1). This includes radiation which may pass around spectacle lenses, so even spectral protection with UV-absorbing lenses may not be sufficient (2). The addition of geometric protection through the use of a hat, visor or close-fitting wrap sunglasses has demonstrated effectiveness of reducing ocular and peri-ocular exposure in both human and mannequin models (3, 4). This study aims to assess the UVR education and protective measure adoption in a rural clinical optometric patient population.

Damage to ocular structures occurs from both acute over-exposure and chronic exposure to UVR (4). The anterior surface of the eye is most easily affected, and commonly acute exposure manifests a photokeratitis or conjunctivitis following unprotected sun exposure. Chronic changes in the cornea and conjunctiva associated with UVR exposure include pterygia and pingueculae. Increased endothelial pleomorphism and polymegathism with chronic exposure has also been demonstrated. Studies also have revealed a link between UVR exposure and cataract development, especially cortical cataracts. Retinal effects of UVR are still a subject of controversy, but it is generally accepted that over or chronic exposure to UVR or short-wave visible light can contribute to macular degeneration (5).

Dermal effects can occur on any exposed skin, but the skin surrounding the eyes is especially delicate and prone to injury. UVR causes oxidative damage to the DNA in basal cells, squamous cells and melanocytes, which over repeated exposures can cause pre-cancerous and cancerous lesions to develop (6). Sunscreen products are very effective at preventing damage, but are often difficult to safely apply around the eyes. The use of sunglasses and a hat/visor are effective means of protecting the skin from exposure, while avoiding the application of products directly to the skin (4).

METHODS

Sixty-nine optometry patients (MCO Eye Center @ FSU) were randomly surveyed regarding their education and understanding about UV exposure (Appendix A). Their spectacles, if available, were evaluated for UV exposure levels in two ways. First the UV transmittance was measured using a standard UV transmittance meter (Spectrum Scan, professional model “EXCEL” by Linnor—Appendix B). Secondly a visual evaluation of the fitting relationship between the spectacles and patients face was made to estimate exposure to radiation above and/or around the lenses. Estimations were grouped into “low,” “medium” and “high” categories based on exposure of less than 10 degrees, 10-30 degrees and greater than 30 degrees, respectively. Data were compiled and analyzed to determine average responses and protection levels.

RESULTS

Seventy-nine percent (79%) of participants reported wearing glasses, but of those only forty four percent (44%) reported awareness that their spectacles provide UV protection [Table 1]. Fifty-three (53) pairs of participants' current spectacle lenses were measured for UV transmittance, with 79 percent (79%) demonstrating at least 95 percent (95%) absorbance. Seven (7) subjects incorrectly reported that their spectacles did not provide UV protection, while only two (2) incorrectly reported having protection. The majority, seventy eight percent (78%), had medium exposure area, while low and high were closely split at nine (9%) and thirteen (13%) percent, respectively.

Exposure Data

Spectacle lenses with at least 95% measured UV absorption	79.2%		
Response of "yes" to glasses having UV protection	44.4%		
Exposure area above and around spectacles	Low	Medium	High
	9.3%	77.8%	13.0%

Table 1

Although the question was intended for those who responded “no” to currently wearing glasses, the majority of responses to the follow-up regarding visor or hat wear was answered by forty five (45) spectacle wearers and seventeen (17) non-wearers. Among spectacle wearers; fifty three percent (53%) responded “sometimes,” thirteen percent (13%) “always” and thirty three percent (33%) “never,” while for non-wearers it was 65, 12 and 23 percent, respectively. [Figure 1] *Overall twice as many people report never wearing a hat or visor than always wearing one.*

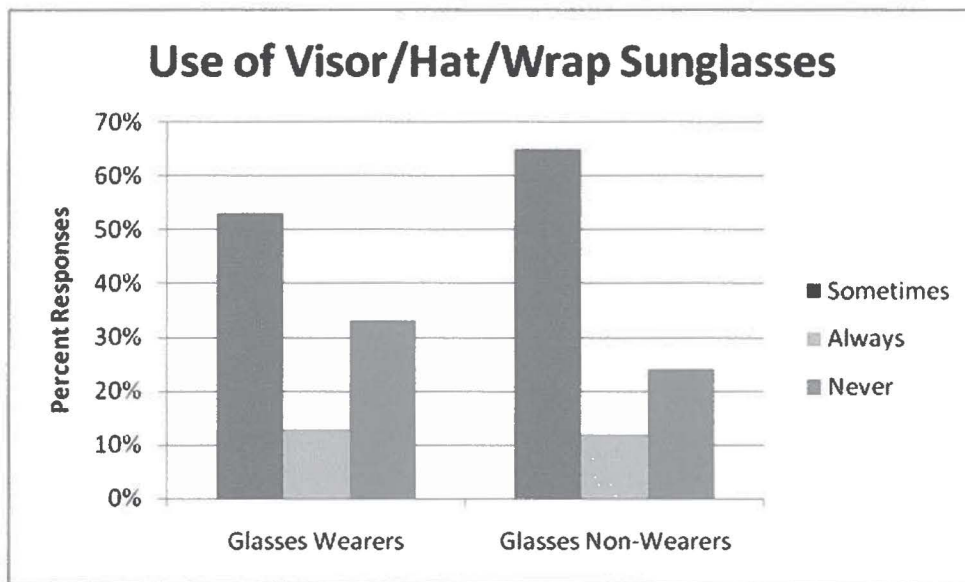


Figure 1

Responses to questions of UV education by their eye-care providers, was generally less than optimal. [Figure 2] Only thirty percent (30%) reported receiving a recommendation to wear a visor, hat or wrap sunglasses with their spectacles, twenty one percent (21%) received printed literature about UV protection, and thirty five percent (35%) were educated about exposure above and around spectacles. Overall Fifty-nine percent (59%) reported receiving education about the harmful effects of UV.

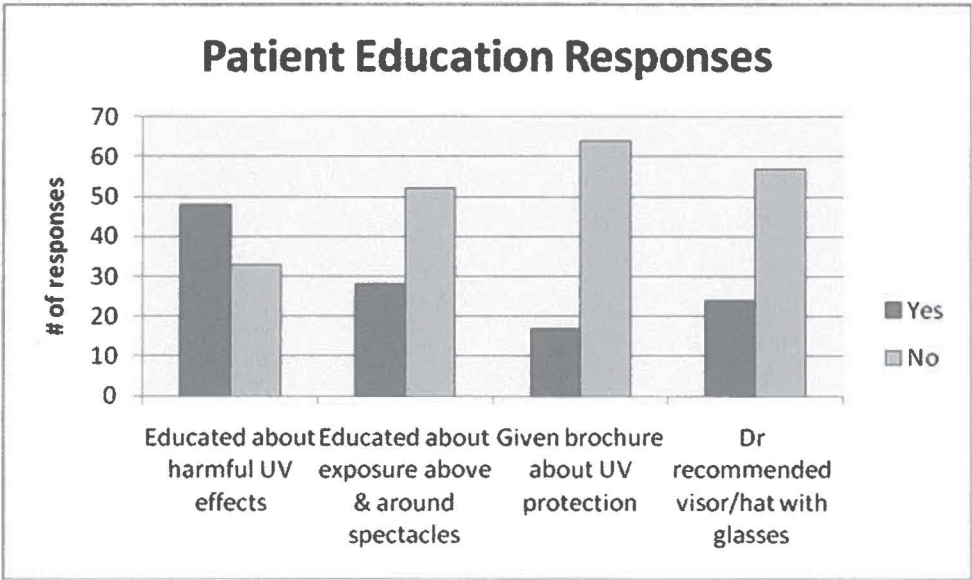


Figure 2

DISCUSSION

Upon analysis of survey data it became apparent that additional questions would provide useful insight into patient understanding. For example, assessing patient responses to their understanding of UV exposure specifically above and around spectacles, their use of protective devices regardless of spectacle wear and further questions to correlate knowledge with UVR protection use would be interesting. While questions in this survey were directed at past education provided by Eyecare practitioners, it did not directly assess the participants' current understanding of UVR risks. Future studies should examine current understanding as it relates to ocular UVR protection.

It is clear from these data that there is a lack of proper awareness among the optometric patient population regarding UVR exposure risk and protection measures. The lack of education patients reported receiving may contribute to the relatively low adoption of hats or visors. The high number of patients who incorrectly reported not having UVR-absorbing lenses indicates that for those, it is/was likely a passive result of materials chosen for cosmetic reasons, rather than an active choice by patients seeking UVR protection. It may be appropriate for eye-care professionals to take steps to include additional education during exams more regularly, especially for patients believed to be at higher risk for UVR exposure or damage.

As primary eye care providers, we are responsible for the general health and well-being of our patients. We frequently detect and advise regarding issue like diabetes and hypertension. We often recommend vitamins for Age Related Macular Degeneration (AMD). We need to educate and advise our patients on proper UV protection to avoid the increased incidence of anterior more than posterior segment eye disease such as pinqueculae, pterygium, corneal changes, cataracts and AMD.

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APPENDIX A

Patient Survey

Do you currently wear glasses? Yes / No

If Yes— Do your current spectacle lenses have UV protection? Yes / No

If No— Do you wear a visor/hat or wrap sunglasses to protect your eyes from ultra-violet (UV)? Sometimes / Always / Never

In the past has your eye-care practitioner ever:

-Educated you about the harmful effects of UV exposure? Yes / No

-Educated you about UV exposure above & around your spectacles or sunglasses? Yes / No

-Given you any brochures or printed information about UV protection? Yes / No

-Recommended visor/hat &/or wrap sunglasses in addition to spectacles or sunglasses? Yes / No