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Knowledge, Attitudes, and Practice of Optometrists in Jordan towards Blue Light Blocking Ophthalmic Devices

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Abstract

This study aims at investigating the level of knowledge, attitudes, and practice habits of optometrists in Jordan towards blue light-blocking ophthalmic devices. A cross-sectional study was conducted using an online survey covering the sociodemographic characteristics of partici-pants, knowledge of sources of blue light, the potential effect of blue light on the eye, and the attitudes and perceptions of optometrists to-wards blue light filtering devices. Of the 381 participants, 67.2% have prescribed blue light filtering devices, with the first pair of lenses pre-scribed in the year 2013. Only 11.9% of the prescribed spectacles were ordered with blue light-blocking filter, with 38.6% citing revenue in-crease as the cause of prescribing the lenses. Blue light was implicated in contributing to digital eye strain and retinal damage by 80.1% and 80.3% of the participants, respectively. Online resources were the main source of information regarding blue light for 52.8% of the partici-pants. Optometrists were most inclined to prescribe blue light filtering lenses if they believe that blue light can cause retinal damage (odds ra-tio, OR 2.06, 95% CI 1.03-3.83, P= 0.027) or digital eye strain (OR 1.81, 95% CI 0.89-3.45, P=0.036). Jordanian optometrists prescribe blue light blocking spectacles mainly to increase profit to the practice, there is a need for education about the benefits of the spectacles.

Keywords

Contact lens, Jordan, Optometry, Short-wavelength light, Spectacles, Survey.

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1. Introduction

Blue light, as part of the visible light spectrum, has a wavelength range between 380 and 500 nm (Sliney, 2016). Apart from the sun which is the main source of blue light, compact fluorescent lamps (CFLs), and light-emitting diodes (LEDs) are common sources of blue light (O'Hagan et al., 2016). Blue light is known to be phototoxic, and it was suggested that long-term blue light exposure plays a role in the development of age-related macular degeneration (AMD) (Noell et al., 1966; Ham et al., 1978; Wu et al., 2006). In addition, with the ubiquitous use of LED digital screens, it is suggested that the exposure to the blue light emitted from these screens contribute to what is known as digital eye strain (DES) (Sheppard & Wolffsohn, 2018).

Despite the apparent harmful effect of blue light on the eye, blue light plays an important role in visual physiological functions and regulation of some physiological functions of the body (Solomon & Lennie, 2007; Chellappa et al., 2011). Blue light of 430 nm wavelength has been shown to play a role in scotopic vision, while blue light of 480 nm wavelength is pivotal in regulating the production of melatonin and controlling the circadian rhythm (Solomon & Lennie, 2007; Chellappa et al., 2011).

Ophthalmic devices, such as blue light-blocking ophthalmic lenses (BBLs), and blue light-blocking intraocular lenses (BBIOLs), have been developed to provide protection to the eye and retina from the potential harm of blue light (Davison & Patel, 2005; Downie, 2017; Hiromoto et al., 2016; Lawrenson et al., 2017). BBIOLs have not been shown to be beneficial in the protection against AMD (Mainster & Turner, 2010). There is also scepticism regarding the benefit of BBLs on the eye's visual functions and the body's physiological functions (Lawrenson et al., 2017). Furthermore, there is no clear evidence that BBLs could alleviate the symptoms of DES (Rosenfield et al., 2020).

There is only one study, to date, that has investigated the knowledge, awareness, and perceptions of optometrists in prescribing blue light-blocking devices which was conducted in Australia (Singh et al., 2019). The study showed an awareness of the potential effects of blue light on the eye, with the main reason for prescribing blue light-blocking spectacles was that patients used digital devices. Nevertheless, it is imperative to provide data from other countries to provide a broader perspective on the prescribing of blue light-blocking devices, especially with the variations in education and scope of practice among optometrists worldwide (Shah et al., 2016).

The study aims at investigating the knowledge level, and awareness of optometrists in Jordan regarding blue light-blocking devices. Furthermore, the study sought to analyse the Jordanian optometrists' attitude towards prescribing blue light-blocking spectacles.

2. Materials and Methods

2.1 *Study design and population*

A web-based, cross-sectional study was conducted during the months of November and December of the year 2020 using an online survey hosted through Google Forms and distributed to optometrists practicing in Jordan through official social media platforms. A sample size of 307 was deemed to represent a population of 1500 optometrists, assuming a 95% confidence interval level and a ± 5% margin of error. Participants who did not agree to the terms of the electronic consent form or responded that they are not licensed to practice optometry in Jordan were excluded from the analysis.

2.2 *Data collection tools*

A questionnaire was adapted from a previous survey conducted on optometrists practicing in Australia (Singh et al., 2019), where 34 multiple-choice close-ended questions covered the sociodemographic characteristics of participants, knowledge of sources of blue light, the potential effect of blue light on the eye, blue light filtering devices, and the attitudes and perceptions of optometrists towards blue light filtering devices.

2.3 *Data analysis and ethical consideration*

Data analysis was performed using the SPSS software version 25 (IBM Corporation, Armonk, NY, USA). Numbers and percentages were calculated to describe categorical and nominal data. The ODDs ratios and 95% Confidence Interval levels were calculated using univariate and multivariate logistic regression. Statistical significance was set at P value lower than 0.05.

The study conformed with the tenets of the Declaration of Helsinki. Ethical approval (approval number: AAU-1/5/2019-2020) was obtained from the Ethical Committee of Faculty of Allied Medical Sciences at Al-Ahliyya Amman University. Consent was obtained from the optometrists by agreeing to participate in the study at the beginning of the online survey. Participants were free to withdraw from the study at any time.

3. Results

3.1 *Participants demographics*

Of the 1500 optometrists reached through social media platforms, 381 optometrists participated in the current study with a response rate of 25.4%. Of the participants, 53.8% were male and 46.2% were female. The age range of the sample population was 24-58 years. The participated optometrists' occupational years of experience ranged from 1 to 34 years. While 79.5%

of the optometrists are working in an independent optical shop, the rest reported working in optical chains. Participants were distributed all over the regions of Jordan; namely North (31.5%), Middle (53.0%), and South (15.5%). The vast majority of the participants (95.5%) studied optometry in Jordan. All the participants were licensed optometrists. However, only 38.8% of the optometrists are licensed to fit and prescribe contact lenses.

3.2 *Optometrists' knowledge and awareness of blue light and its ocular effects*

Majority of the optometrists correctly pinpointed that the wavelength range of blue light in the electromagnetic spectrum is 400-500 nm (84.0%) whereas 13.6% answered 500-600 nm, and 2.4% were not sure. Table 1 depicts the sources of blue-light emission as prospected by the participants.

Table 1
Sources of blue-light emission as reported by the participants.

Source of blue light emission	Percentage (%)
Mobile phone	89
Tablet	82.2
Sun	73.5
Cathode ray tube monitor	66.7
Light emitting diode	57.7
Liquid crystal display (LCD) screen	3.1
Incandescent light	2.4
Fluorescent light	1.6

Only 48% of the participants acknowledged the role of blue light in colour vision, in addition, 44.3% agreed on its role in sleep pattern regulations. Other functions including contrast sensitivity, visual acuity, scotopic vision, and stereopsis were less recognized (6.3%, 5.2%, 4.7%, and 4.2%, respectively). Majority of the optometrists (80.1%) believe that blue light emitted from digital screens play an important role in developing digital eye strain. Similarly, environmental exposure to blue light causes retinal damage was endorsed by 80.3% of the participants.

3.3 *Optometrists clinical practice patterns relating to blue light-blocking devices*

Amongst the participants, 67.2% have prescribed blue light filtering devices. Three optometrists prescribed their first blue light-blocking lens in 2013, incidences of blue light-blocking lenses prescription were gradually increasing up to the year 2018. However, a decrease in first-time blue light devices prescription was observed in the year 2019.

Amongst the prescribed spectacles in the last 12 months by the participants, only 11.9% of the prescribed spectacles were ordered with blue light-blocking filter. However, none of the participants prescribed blue light-blocking contact lenses. Amongst those who prescribed blue light spectacle lenses, only 2.1% prescribe them constantly, while 16.0% prescribed blue light spectacles occasionally. Amongst participants who have never prescribed blue light spectacle lenses; 11% were not aware of such spectacle lenses, whereas 21.8% justified the zero incidence of blue light-blocking device prescription is their lack of information of their presence in their practice and not believing in their clinical rationale.

On the other hand, all the practitioners agreed that blue light contact lenses are not clinically advocated and that blue light contact lenses are not available in the region. Regarding the age range which optometrists would prescribe blue light-blocking spectacles, blue light spectacle lenses were mostly prescribed to the age range of 11-20 years (67.2%).

Many participants (38.6%) justified blue light filter spectacle lenses prescription to increase practice revenue. On the other hand, patients asked for such lenses in 6% of the cases. Moreover, blue light spectacle lenses were prescribed for patients who frequently use digital devices (31.8%) or have symptoms of digital eye strain (23.4%). Furthermore, participants prescribed them for their protective measure from blue light (13.4%). The most common source of information that the optometrists in Jordan rely on for decision making regarding prescribing blue light-filtering devices, is online resources (52.8%), followed by industry product information (39.9%), and the advice of colleagues (29.7%). Conference presentations (18.9%) and published research articles were less recognized as sources of information (15%).

3.4 *Optometrists' perceptions regarding the clinical efficacy for blue light filter lenses*

Of the optometrists surveyed, 61.2% believe that blue light-blocking spectacles are suitable to be worn all the time. However, 55.4% of the participants think that blue light protection can be ordered with all spectacle prescriptions. In the same context, changing the internal screen setting of electronic devices was believed to be effective by 32% of the participants. All the participants believe that optometrists are responsible for prescribing blue light-filtering spectacle lenses while the ophthalmologists are responsible for prescribing intra-ocular lenses containing blue light filter. Only 9.2% of the participants strongly agree that advertisements for blue-blocking products provide an accurate representation of the risks associated with blue light exposure. However, 7.9% of the participants strongly disagree. The quality of published evidence supporting the efficacy of blue light filtering lenses for managing digital eye strain was deemed as 'medium' by

59.3% of the participants. Whereas 20.2% think that the quality of the same is high. However, few optometrists believe that the quality is low (10%).

3.5 *Predictive factors for prescribing blue light filtering spectacle lenses*

Table 2 compiles the predictive factors for optometrists to prescribe spectacles with blue light-filtering lenses. In univariate ordinal regression analysis, optometrists were most inclined to prescribe blue light filtering lenses if they believe that blue light can cause retinal damage. Correctly identifying the wavelength of blue light did not reach statistical significance.

As there was no statistically significant association between the inclination to prescribe blue light-filtering lenses and the practitioners' belief towards the quality of published papers on blue light-filtering devices or the knowledge of the wavelength of blue light; these factors were excluded from the multivariate ordinal regression analysis. In multivariate analysis, participants' beliefs regarding the effect of blue light on retina or its role in developing digital eye strain were the only factors that showed statistical significance. Workplace setting, and years of experience were not statistically significant.

4. Discussion

This is the first study to survey the knowledge, awareness and perception of optometrists in a developing country towards blue light-blocking ophthalmic devices. Although Jordanian optometrists acknowledged the role of blue light in retinal damage and digital eye strain, they showed reduced level of knowledge of blue light function in the body and eye's physiological functions (Chellappa et al., 2011), which is in agreement with the results obtained from Australian optometrists (Singh et al., 2019). Although the level of education of optometry differs between Australia, a developed country, and Jordan, a developing country, it seems that basic knowledge of the effect of blue light on the eye and body are communicated well among optometrists in both countries. Regarding the sources of blue light, optometrists from both countries agreed that mobile phones are considered the most important source of blue light, rather than the sun (Singh et al., 2019). This is of interest as the levels of blue light emitted from mobile phones are within safety limits (ICNIRP, 2013). It seems that there is a need for education about sources of blue light among optometrists regardless of their level of education, scope of practice, and country of practice.

Of the participants, 67.2% have prescribed blue light filtering devices, with the first pair of BBLs prescribed in 2013. The main reason cited for prescribing BBLs was to increase revenue to the optometry practice. This is in agreement with the results obtained from optometrists in Australia which indicates that optometry practice in various countries is similar in terms of practice revenue schemes (Singh et al., 2019). However, more optometrists in Australia prescribed BBLs for patients presenting with DES compared to optometrists in Jordan. BBLs have not

Table 2
Anticipated factors for optometrists prescribing blue light filtering spectacle lenses

Factor	Response	Univariate analysis		Multivariate analysis	
		OR (95% CI)	P	OR (95% CI)	P
Do you think that daily environmental exposure to blue light can cause retinal damage?	Yes	2.39 (1.02 - 3.76)	0.001	2.06 (1.03 - 3.83)	0.027
	Not sure	0.64 (-0.81 - 2.08)	0.39	1.45 (-1.82 - 4.72)	0.39
	No				
Wavelength of blue light	Correct	0.5 (0.01-1)	0.05		
	Incorrect				
Do you think blue light emitted from digital screens play an important role in developing digital eye strain?	Yes	2.21 (0.79 - 3.63)	0.002	1.81 (0.89 - 3.45)	0.036
	Not sure	0.3 (-1.19 - 1.78)	0.7	0.27 (0.23 - 1.73)	0.87
	No				
What do you think is the quality of published evidence supporting the efficacy of blue light filtering lenses for managing digital eye strain?	High	0.06 (-0.64 - 0.76)	0.87		
	Medium	0.46 (-0.16 - 1.01)	0.15		
	Low	0.64 (-0.17 - 1.44)	0.12		
	No				
Work setting	Independent	1.14 (0.64 -1.64)	<0.001	1.08 (1.15 - 2.22)	0.11
	Optical chain				
Years of experience	More than 21 years	1.1 (0.45 - 1.75)	0.001	1.09 (0.94 - 1.99)	0.08
	11-20 years	1.02 (0.61 - 1.42)	<0.001	1.01 (0.58 - 1.44)	0.07
	1-10				

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been clinically proven to be effective in the management of DES (Rosenfield et al., 2020). Optometrists in both countries rely mainly on colleagues' recommendations and information supplied by manufacturers, while the minority rely on peer-reviewed publications and conferences. It is of importance to emphasize the need for education among optometrists based on data driven from evidence-based publications.

Unlike Australian optometrists, optometrists in Jordan are not involved with the provision of IOLs, thus, they were less acknowledged as a form of blue light-blocking device. In addition, optometrists in Jordan noted that blue light-blocking contact lenses are not available in Jordan, whereas optometrists in Australia cited contact lenses as a type of devices used to block blue light (Singh et al., 2019). This highlights the importance to conduct studies on optometrists from different levels of education and scope of practice to allow the industry to tailor the services provided according to the needs of the optometrists.

4.1 *Limitations*

A limitation of the study was the lack of knowledge shown by optometrists about the available brands of BBLs and the percentage of blue light filtered by these lenses. Optometrists in Australia demonstrated inconsistencies in knowledge about the percentage of blue light blocked by the brands and the published data. Manufacturers are encouraged to provide optometrists with detailed technical data regarding the percentage of blue light that is blocked and the wavelength range that the lens is blocking to allow better clinical judgement (Singh et al., 2019).

4.2 *Conclusions*

The study probed the level of knowledge of optometrists practicing in Jordan, a developing country, with a limited legal scope of optometry practice. In addition, attitudes towards blue light blocking ophthalmic devices and prescribing practice were evaluated and have shown to be inconsistent with the knowledge level. Optometrists in Jordan showed a reduced reliance on conferences and peer-reviewed publications as a source of information regarding blue light.

It is evident that profit to the practice was the main reason for prescribing blue light blocking spectacles, which reflects the equivocal evidence for the efficacy of these lenses. This supports the need for further education and training of optometrists utilizing peer-reviewed, evidence-based sources of information.

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Conflict of interests:

The authors declare that there is no conflict of interest.

Contribution of authors:

YG: Conceptualization-Lead, Resources-Equal, Validation-Equal, Writing-original draft-Equal, Writing-review & editing-Lead, Reading and approving the final draft-Lead.

EA: Conceptualization-Supporting, Resources-Equal, Validation-Equal, Writing-original draft-Equal, Writing-review & editing-Supporting, Reading and approving the final draft-Supporting.

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