



LETTER

Response to the Letter to the Editor Regarding “Blue Light Exposure: Ocular Hazards and Prevention—A Narrative Review” by Iqbal et al.

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Dear Editor,

We read with great interest the letter to the editor from Iqbal et al. entitled “Letter to the Editor Regarding Blue Light Exposure: Ocular Hazards and Prevention—A Narrative Review”. We thank Iqbal et al. for their letter and comments, as well as for noting the lack of citations for their three studies in our review. In response to their letter, their studies did not appear in our bibliographic search as a result of the keywords used or the dates selected (maximum 2022) in our review [1]. This unintended omission is one of the biases of narrative reviews and was not deliberate on our part. We have therefore read the research of Iqbal et al. [2–4] with attention and congratulate them on a very interesting and innovative work in some aspects. However, we would like to build on the

comments of Iqbal et al. regarding the conclusion of our review.

We agree that screen exposure can induce visual syndromes such as blurred vision, dry eyes, headaches mainly due to improper use of the screen such as studying in the dark, not taking breaks for hours, not respecting distances or angles to read on these screens, the size of the screen when reading long documents, putting the brightness too high, and having a poor visual correction. These features characterizing misuse of screens are the main factors that Iqbal et al. reported as being significantly associated with computer vision syndrome (CVS) in their studies [2–4]. In this context, we have reported in our manuscript [1] advice on proper ergonomic and environmental issues when subjects spend an extended period of time looking at electronic devices, such as those from the American Academy of Ophthalmologists (AAO) to reduce symptoms of CVS, digital eye strain, and occupational fatigue [5, 6]. The first was the “20–20–20” rule: every 20 min, individuals should pause for at least 20 s and focus their eyes on an object more than 20 feet (about 6 m) away. The second is eye-to-screen distance: people should sit at a distance of about 63 cm from their computer screen (which should be tilted slightly downwards). Finally, the last one concerns reflections and brightness: one should reduce screen reflections as much as possible

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and make sure that the digital screen is not brighter than the surrounding light.

We do not agree with Iqbal et al.'s remark that they have "already proved the existence of the screen-induced foveal dysfunction with affection of the macular integrity in three clinical trials". Their very interesting studies report significant associations between long screen exposure and reduced foveal function as measured by multifocal electroretinogram (mfERG) changes in small groups of medical students with CVS [2–4]. These are the first studies to examine this association and to use the mfERG to assess the status of foveal function. However, these significant results cannot be considered a high level of evidence-based medicine. The validity of the three studies by Iqbal et al. [2–4] is not sufficient to report proof or to advance evidence of the retinotoxic effect of long screen exposure on foveal function, or specifically of blue light exposure. Firstly, the cross-sectional design of the two studies published in 2021 means that it is not possible to attribute causality to the associations observed with foveal function [2, 3]; moreover, the samples size were small (20 in the control group vs 20 in the CVS group [3]; 44 in the control group vs 46 in the CVS group [2]); only one eye per individual was examined despite statistical tools that allow both eyes to be taken into account in analyses; the use of only univariate tests [2, 3] and the lack of correction for the multiple testing despite the large number of tests performed increase the chance of observing at least one significant result; and the low-exposure group is not represented and therefore one cannot infer that the results apply to the entire study population [2, 3]. In addition, in these studies, they have not examined the effect of blue filters in glasses, or of a blue light computer filter on ocular function, nor the effect of a combination of blue filters in glasses and on the computer [2, 3]. Most of these limitations also pertain to the longitudinal study [4]. In the conclusion of our review the last sentence was "however, the potential toxicity of long-term cumulative exposure and the dose–response effect are currently unknown", which is in line with Iqbal et al.'s own conclusion [1]. Thus, Iqbal et al.'s studies do not provide sufficient

evidence of a causal association between exposure to blue light in screens and the occurrence of foveolar dysfunction and therefore do not change our conclusion that there is no evidence that LEDs in normal use at domestic intensity levels or in screen devices are retinotoxic to the human eye.

However, this does not prevent the scientific interest of these studies on a sensitive subject which must be replicated in prospective, longitudinal studies with larger samples, in other countries, and in other types of populations (less selected samples not only students). As explained in our review article, we believe that the ocular effect of exposure over decades needs to be evaluated in future epidemiological studies as we have insufficient data on the dose–response effect of blue light and on the spectral imbalance exposure especially in children, adolescents, and sensitive populations. Further studies are needed to better understand the mechanisms of photochemical injury related to blue light exposure, and to determine whether long-term, low-level exposure to artificial blue light is a risk factor for age-related macular degeneration or other eye conditions [1, 7–9]. In the meantime, to prevent potential ocular hazards of blue light, it may be advised to limit exposure.

In conclusion, we apologize that our literature search did not select the studies by Iqbal et al. [2–4], but we consider that this omission does not affect the content of our manuscript and in particular our conclusions. Nevertheless, we agree with Iqbal et al. that we do not know the long-term retinotoxic effects of backlight/blue light exposure from screens on the eye, as mentioned in our review. Further studies are needed to examine the potential retinotoxic effects of short- and long-term use of screens, including explorations of retinal function such as mfERG. Finally, in line with Iqbal et al. on the misuse of electronic screens, people must be aware of good practices to avoid the development of visual syndrome and a potential deleterious long-term effect on the eye.

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Compliance with Ethics Guidelines. This article is based on previously conducted studies and does not contain any new studies with human participants or animals performed by any of the authors.

Data Availability. Data sharing is not applicable to this article as no datasets were generated or analyzed during the current study.

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