



SLEEP'S EFFECT ON THE OCULAR SURFACE



Poor quality and duration may play a role in the development of dry eye.

BY JOSH DAVIDSON, OD, FAAO, FSLs

Over the years, I've realized how common lack of sleep is in most of my patients with dry eye, convincing me that it significantly contributes to their symptoms. Recent research backs this up and, in fact, indicates that patients experiencing poor sleep are 50% more likely to develop dry eye than those with appropriate sleep patterns.¹ Notably, poor sleep also significantly raises the risk of developing highly symptomatic dry eye. I'll explore this connection in more detail below.

LITERATURE REVIEW

Upon reviewing some of the latest research studying the connection

between sleep and dry eye disease (DED), it appears many studies pinpoint lifestyle and other connective factors as overarching contributors. Let's take a closer look.

Lifestyle Epidemic

In 2023, the Tear Film & Ocular Surface Society (TFOS) released "The TFOS Lifestyle Report: A Lifestyle Epidemic – Ocular Surface Disease,"² which comprised 158 ocular surface experts from 38 different countries and was the first global panel to create a comprehensive, evidence-based review of all the available literature on how lifestyle affects the ocular surface. In total, eight reports were

published covering a variety of topics, including sleep, contact lens wear, digital technology use, climate, elective procedures, nutrition, and sleep.

The report on sleep stated in its abstract, "Sleep disorders (both involving quality and quantity of sleep) have also been associated with DED symptoms."² Additionally, the report noted that a systemic review and meta-analysis of 19 articles found that, when compared with controls, patients with DED have poorer sleep quality, spend less time asleep, experience more sleep disturbances, and may have increased prevalence, incidence, and severity of their sleep disorders. All of this was found to be especially true in individuals with Sjögren syndrome.

The paper described various worldwide studies that support this connection, including a Singapore study showing several aspects of sleep (poor subjective sleep quality, prolonged sleep latency, short sleep duration, poor habitual sleep efficiency, sleep disturbance, and daytime dysfunction) are all associated with increased DED symptoms.³ A Japanese study also showed that shorter sleep duration (defined as fewer than 8 hours) is associated with DED.⁴

Other studies noted included a Korean analysis, which showed that getting at least 9 hours of sleep per

“

INSUFFICIENT SLEEP MAY ALSO IMPEDE THE OCULAR SURFACE REPAIR PROCESS. RESEARCHERS HAVE DISCOVERED THAT THE TEARS FROM CLOSED EYES HAVE IMMUNOSUPPRESSIVE PROPERTIES, AND THESE ANTIPROTEASES ARE BELIEVED TO BE RELEASED INTO TEARS DURING SLEEP.

”

night is associated with lower odds of DED symptoms,¹ as well as a study out of the Netherlands, which concluded that patients with DED have issues with sleep quality, even after correcting for more than 50 other comorbidities.⁵

CONNECTIVE FACTORS

It is believed that several mechanisms link sleep disorders to DED. One such hypothesis is that poor sleep reduces androgen levels, changes circadian rhythms, and releases stress hormones, all of which result in poor tear secretion.¹ Low androgen levels have been found to affect lacrimal and meibomian gland functions, and interestingly, some studies show that a regular circadian rhythm follows lacrimal secretion; thus, sleep disturbances can throw the lacrimal gland into disarray.^{6,7}

It is also believed that there is an autonomic nervous system connection between sleep disorders and DED.⁸ Those experiencing sleep deprivation show a decrease in parasympathetic

activity, and reduced innervation reduces tear flow. Less sleep also causes greater tear film instability and increases tear evaporation.

One of the most compelling pieces of information is that insufficient sleep may also impede the ocular surface repair process. Researchers have discovered that the tears from closed eyes have immunosuppressive properties, and these antiproteases are believed to be released into tears during sleep.⁹ A relatively new mouse study shows poor sleep can cause the cornea to lose its ability to properly heal itself by damaging corneal stem cells.¹⁰ Another study shows that highly symptomatic dry eye was one of the top five conditions that reduced patients' sleep quality.¹

APPLIED LEARNING

What can we take away from these studies? As optometrists, we know the eye is the window to the whole body, and we are constantly reminded of ways in which it can indicate systemic health issues. I

implore you to ask your patients with ocular surface disease about their sleep habits. If they are experiencing poor sleep quality or quantity, then it may be worth having a discussion with them about supplemental therapy and ways they can modify their environment and lifestyle to not only improve their ocular health, but also their overall health.

DOMINO EFFECT

This topic deserves much more discussion—and on a wider level than just DED. We know that both the quality and quantity of sleep affect our entire body, and we must thus emphasize to our patients with dry eye the importance of getting a good night's sleep. ■

1. Magno MS, Utheim TP, Snieder H, Hammond CJ, Vehof J. The relationship between dry eye and sleep quality. *Ocul Surf.* 2021;20:13–19.
2. Galor A, Britten-Jones AC, Feng Y, et al. TFOS lifestyle: impact of lifestyle challenges on the ocular surface. *Ocul Surf.* 2023;28:262–303.
3. Lim EW, Chee ML, Sabanayagam C, et al. Relationship between sleep and symptoms of tear dysfunction in Singapore Malays and Indians. *Invest Ophthalmol Vis Sci.* 2019;60:1889–1897.
4. Hanyuda A, Sawada N, Uchino M, et al. Relationship between unhealthy sleep status and dry eye symptoms in a Japanese population: the JPHC-NEXT study. *Ocul Surf.* 2021;21:306–312.
5. Kim KI, Park YS, Kim RH, Kim JH. Factors associated with dry eye symptoms in elderly Koreans the fifth Korea National Health and Nutrition Examination Survey 2010–2012. *Korean J Fam Med.* 2019;40(1):22–30.
6. Vu CH, Kawashima M, Nakamura W, Nakamura TJ. Circadian clock regulates tear secretion in the lacrimal gland. *Exp Eye Res.* 2021;206:108524.
7. Huang S, Si H, Liu J, et al. Sleep loss causes dysfunction in murine extraorbital lacrimal glands. *Invest Ophthalmol Vis Sci.* 2022;63(6):19.
8. Kim H, Jung HR, Kim JB, Kim DJ. Autonomic dysfunction in sleep disorders from neurobiological basis to potential therapeutic approaches. *J Clin Neurol.* 2022;18(2):140–151.
9. Li A, Zhang X, Guo Y, et al. The association between dry eye and sleep disorders: the evidence and possible mechanisms. *Nat Sci Sleep.* 2022;14:2203–2212.
10. Li S, Tang L, Zhou J, et al. Sleep deprivation induces corneal epithelial progenitor cell over-expansion through disruption of redox homeostasis in the tear film. *Stem Cell Reports.* 2022;17(5):1105–1119.

JOSH DAVIDSON, OD, FAAO, FSLs

- Optometrist, Williamson Eye Center, Baton Rouge, Louisiana
- Member, *Modern Optometry* Editorial Advisory Board
- jddavidson@weceye.com; Instagram @dryeyeed
- Financial disclosure: Advisory Board Member (Eyevance Pharmaceuticals, Kala Pharmaceuticals); Speaker (Eyevance Pharmaceuticals, Glaukos, Kala Pharmaceuticals)