Association Between Screen Time Duration and the Incidence of Dry Eye Syndrome Among Educational Staff at Nusa Cendana University

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ABSTRACT

Background: The rising intensity of digital device use in daily activities contributes to prolonged screen time, which may disrupt tear film stability through reduced blink frequency and increased evaporation. Educational staff represent a high-risk group due to the sedentary nature of their work and prolonged screen exposure in air-conditioned environments that can exacerbate ocular surface disturbances.

Objective: To assess the association between screen time duration and the occurrence of Dry Eye Syndrome (DES) among educational staff at the University of Nusa Cendana.

Methods: This analytical observational study with a cross-sectional design was conducted from September to October 2025. A total of 54 respondents were selected using cluster random sampling. Screen time duration was measured using the Screen Time Questionnaire (STQ), while DES symptoms were evaluated using the Ocular Surface Disease Index (OSDI). Correlation analysis was performed using the Spearman Rank test.

Results: Most respondents reported a moderate level of screen time exposure (46.3%) and normal ocular status based on OSDI (50%). However, 24.1% of respondents were identified as having severe DES. Statistical analysis demonstrated a significant positive correlation of moderate strength between screen time duration and DES severity ($p = 0.003$; $r = 0.400$). Respondents with high and very high screen time exposure tended to exhibit more severe symptomatic manifestations.

Conclusion: Screen time duration is significantly associated with the severity of Dry Eye Syndrome among educational staff. Interventions such as scheduled visual breaks and ergonomic adjustments in the workplace are recommended to reduce the risk of ocular surface disorders.

KEYWORDS: Dry Eye Syndrome, Educational Staff, Screen Time, OSDI.

INTRODUCTION

Technology use in daily life continues to expand, resulting in longer durations of digital device exposure (screen time). National statistics indicate that internet access and digital device ownership in Indonesia increased from 53.73% in 2020 to 69.21% in 2023.[1] This shift has important implications for health, including a higher risk of Dry Eye Syndrome (DES). Dry Eye Syndrome is an ocular surface disorder that arises when tear film homeostasis is disrupted. Prolonged screen exposure can reduce blink rate and increase tear evaporation, contributing to ocular dryness.[2,3] Multiple studies have reported that each additional hour of daily screen time is associated with an 11–12% higher likelihood of severe DES symptoms in adults.[4]

At the global level, the prevalence of DES has been estimated at 11.59%, with substantial geographic variability.[5] In Asia, an increase in DES prevalence of 14.6% has been reported over the 2016–2022 period.[6] In Indonesia, several studies have documented high rates of DES. Research in Jakarta reported a prevalence of 77.4%.[7] In Kupang City, prevalence was reported as 74.4% among students and 50.9% in the general population.[8,9] Unaddressed DES may reduce comfort during daily activities, impair work productivity, and increase healthcare-related expenditures.[2,10]

Educational staff represent a population with elevated exposure to established DES risk factors. Their work is predominantly sedentary and commonly requires computer use for most of the workday, approximately 8 hours per day.[11]

Occupational risk may be further amplified by air-conditioned indoor environments with low humidity, which can accelerate tear evaporation.[12] These combined occupational and environmental exposures make educational staff a relevant group for investigation.

Evidence on the association between screen time and DES across populations has been heterogeneous. A study in medical students reported no statistically meaningful association,[13] and other studies have reported higher risk among individuals with screen use exceeding 8 hours per day.[11] Data focusing on educational staff, particularly in Eastern Indonesia, remain limited. This study therefore aims to examine the association between screen time duration and DES among educational staff at Nusa Cendana University, with the goal of informing more targeted occupational health programs.

METHODS

This study employed an analytical observational design with a cross-sectional approach and was conducted at Nusa Cendana University, Kupang City, East Nusa Tenggara. Primary data were collected in person from 15 to 24 October 2025. The study population comprised all active educational staff at the university. Participants were selected using cluster random sampling, with faculties defined as the cluster units to ensure representation across administrative and operational units. Sample size was calculated using an analytic correlational formula, with an additional 10% allowance for potential dropout, yielding a target of 54 respondents. Eligible participants were active educational staff who used digital screen-based devices in daily activities and provided written informed consent. To reduce confounding, exclusion criteria included a history of chronic ocular disease other than refractive errors, contact lens use, autoimmune disease or uncontrolled systemic disease, prior ocular surgery, and use of systemic medications known to affect tear production, including antihistamines, diuretics, or antidepressants.

The independent variable was screen time duration, assessed using the Screen Time Questionnaire (STQ). The STQ estimated average daily screen exposure by differentiating weekday and weekend use, and categorized screen time into four levels: low (≤4 hours/day), moderate (5–8 hours/day), high (9–12 hours/day), and very high (>12 hours/day). The dependent variable was the occurrence of Dry Eye Syndrome, evaluated using the Ocular Surface Disease Index (OSDI). The OSDI consists of 12 items assessing symptoms, environmental triggers, and vision-related functional impact over the preceding week. OSDI scores were classified as normal (<13), mild (13–22), moderate (23–32), and severe (≥33).

Data were processed and analyzed using statistical software. Univariate analyses were performed to summarize participant characteristics and to describe the distributions of screen time categories and dry eye severity. The association between screen time duration and Dry Eye Syndrome was evaluated using Spearman's rank correlation because both variables were measured on ordinal scales. A p-value <0.05 was used to define statistical significance. All study procedures followed ethical principles, including provision of study information, protection of data confidentiality, and obtaining written consent from each participant before questionnaire administration.

RESULT

Fifty-four educational staff were enrolled. Sex distribution was equal, with 27 men (50.0%) and 27 women (50.0%). The largest age group was 36–45 years (n=20; 37.0%), followed by 46–55 years (n=18; 33.3%). Most participants had been employed for more than five years, with the highest proportion in the 6–10-year tenure category (24.1%).

Table 1. Demographic characteristics of respondents (n=54)

Characteristic	Category	n	%
Sex	Male	27	50.0
	Female	27	50.0
Age	≤25 years	1	1.9
	26–35 years	14	25.9
	36–45 years	20	37.0
	46–55 years	18	33.3
	56–65 years	1	1.9

Most respondents reported moderate screen time (5–8 hours/day), with 25 people (46.3%). High screen time (9–12 hours/day) was reported by 9 people (16.7%), and very high screen time (>12 hours/day) by 6 people (11.1%). Based on OSDI results, 27 respondents (50.0%) were in the normal range. The rest had dry eye symptoms: 11 (20.4%) mild, 3 (5.6%) moderate, and 13 (24.1%) severe.

The link between screen time and dry eye severity was tested using Spearman's rank correlation. The cross-tabulation showed that more severe symptoms were more common at higher screen time levels. In the high screen time group, 6 of 9 respondents (66.7%) had severe dry eye. In the very high screen time group, 3 of 6 (50.0%) had severe dry eye. In the low screen time group, most were normal (9 of 14; 64.3%). Spearman's test showed a significant positive, moderate correlation between screen time and dry eye severity ($p=0.003$; $r=0.400$).

Table 2. Screen time and dry eye severity (OSDI categories)

Screen time duration	Normal	Mild	Moderate	Severe	Total	p-value	r
Low (≤4 h/day)	9 (64.3%)	4 (28.6%)	1 (7.1%)	0 (0.0%)	14 (25.9%)		
Moderate (5–8 h/day)	14 (56.0%)	5 (20.0%)	2 (8.0%)	4 (16.0%)	25 (46.3%)	0.003	0.400
High (9–12 h/day)	3 (33.3%)	0 (0.0%)	0 (0.0%)	6 (66.7%)	9 (16.7%)		
Very high (>12 h/day)	1 (16.7%)	2 (33.3%)	0 (0.0%)	3 (50.0%)	6 (11.1%)		
Total (overall)	27 (50.0%)	11 (20.4%)	3 (5.6%)	13 (24.1%)	54 (100.0%)		

DISCUSSION

This study demonstrated a statistically significant, moderate positive association between screen time duration and Dry Eye Syndrome (DES) severity among educational staff ($p=0.003$; $r=0.400$). Longer daily screen exposure was associated with a higher level of dry eye symptoms. Evidence from other adult populations has reported higher OSDI scores among individuals with prolonged daily screen exposure, supporting the direction of the association observed in this study.[14,15]

Variation in findings across settings has been reported, including studies in younger populations in which an association was not detected.[13] Differences in age distribution may be relevant, as younger individuals may have greater tear film stability and ocular adaptive capacity compared with working-age staff predominantly in mid-adulthood.[13] A plausible mechanism linking prolonged screen exposure to DES involves reduced blink rate during sustained visual attention. Lower blink frequency prolongs the interblink interval and increases tear evaporation.[11] Tear hyperosmolarity can then activate inflammatory pathways on the ocular surface, impair mucin-producing goblet cells, and contribute to a self-perpetuating cycle of tear film instability.[3]

Demographic characteristics in this cohort may have contributed to the observed DES burden. Female participants may be more susceptible to DES through hormonal influences that affect meibomian gland function and tear production.[16] The predominance of participants aged >35 years is also clinically relevant, given age-associated changes in the lacrimal functional unit and reduced basal tear secretion.[17] Workplace conditions may further reinforce the association. Most educational staff worked in air-conditioned indoor environments, where lower humidity can accelerate tear evaporation and intensify dry eye symptoms.[18] Taken together, occupational screen exposure and environmental dryness may act synergistically to increase symptom severity.[18] Several limitations warrant consideration. First, DES classification relied on symptom assessment using OSDI without objective clinical tests such as Schirmer testing or tear break-up time, which may introduce subjective reporting bias. Second, this study did not quantify environmental parameters (humidity, temperature, lighting) or visual ergonomics (viewing distance and screen positioning), which may confound the observed association.[18]

CONCLUSION

Based on the study findings, approximately half of the educational staff at Nusa Cendana University reported symptoms consistent with Dry Eye Syndrome (DES) across a range of severity levels, and nearly one-quarter of respondents were classified as severe. Patterns of digital device use indicated that most respondents fell within the moderate screen time category. Statistical analysis also demonstrated a statistically significant, positive association of moderate strength between screen time duration and

DES severity. Overall, these results support the conclusion that longer exposure to digital screens is associated with a higher risk and greater severity of dry eye symptoms among educational staff.

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