

IDENTIFIKASI DAN ANALISIS FAKTOR RISIKO KEPARAHAN SINDROM MATA KERING PADA PASIEN POLI PENYAKIT DALAM DI RSI UNISMA

Iftita Khumairo, Tri Wahyu Sarwiyata, Ariana Ratri Dewi*

*Fakultas Kedokteran, Universitas Islam Malang

Latar Belakang: *Dry Eye Syndrome* (DES) merupakan gangguan multifaktorial pada lapisan air mata yang ditandai oleh ketidakstabilan film air mata, hiperosmolaritas, inflamasi, serta kerusakan permukaan okular. Peningkatan prevalensi DES berkaitan dengan perubahan gaya hidup modern, seperti paparan layar digital dalam waktu lama, penggunaan lensa kontak, serta adanya penyakit penyerta (komorbid) seperti diabetes melitus, hipertensi, dislipidemia, dan rosacea.

Metode: Penelitian ini merupakan studi analitik observasional dengan desain potong lintang (*cross-sectional*) yang dilakukan di Poliklinik Penyakit Dalam RSI UNISMA Malang pada bulan Oktober–November 2025. Sebanyak 305 responden yang memenuhi kriteria inklusi diambil menggunakan teknik *accidental sampling*. Data primer dikumpulkan melalui kuesioner faktor risiko dan *Ocular Surface Disease Index* (OSDI). Analisis statistik menggunakan uji Chi-square untuk menilai hubungan faktor risiko terhadap kejadian DES, serta uji korelasi Spearman untuk menilai hubungan komorbid terhadap tingkat keparahan DES.

Hasil dan Pembahasan: Dari 305 responden, 177 orang mengalami DES (prevalensi 58%), dengan derajat ringan 23,3%, sedang 18,7%, dan berat 16,1%. Terdapat hubungan bermakna antara kejadian DES dengan usia ($p=0,000$), pekerjaan ($p=0,000$), dan durasi paparan layar ($p=0,002$). Rerata skor OSDI meningkat seiring jumlah dan jenis komorbiditas, yang menunjukkan kecenderungan peningkatan keparahan DES pada responden dengan faktor risiko sistemik. Uji Spearman menunjukkan hubungan bermakna antara tingkat keparahan DES dengan diabetes melitus ($r=-0,380$; $p=0,000$), hipertensi ($r=-0,233$; $p=0,000$), dislipidemia ($r=-0,130$; $p=0,023$), dan rosacea ($r=-0,203$; $p=0,000$).

Kesimpulan: DES memiliki prevalensi tinggi pada pasien rawat jalan penyakit dalam RSI UNISMA dan berhubungan dengan komorbiditas metabolik serta durasi paparan layar. Deteksi dini dan edukasi pasien penting untuk mencegah perburukan gejala dan meningkatkan kualitas hidup.

Kata kunci: *Dry Eye Syndrome*, *Ocular Surface Disease Index*, komorbiditas, durasi paparan layar, lensa kontak.

*Korespondensi: dr. Ariani Ratri Dewi, Sp. M

Alamat : Jl. MT Haryono 193 Malang, Jawa Timur Indonesia 65144. Telp (0341)578920

Email : arianiratriidewi@unisma.ac.id

IDENTIFICATION AND ANALYSIS OF RISK FACTORS ASSOCIATED WITH THE SEVERITY OF DRY EYE SYNDROME IN INTERNAL MEDICINE OUTPATIENTS AT RSI UNISMA

Iftita Khumairo, Tri Wahyu Sarwiyata, Ariana Ratri Dewi*

*Faculty of Medicine, University of Islam Malang

Background: *Dry Eye Syndrome* (DES) is a multifactorial tear film disorder characterized by tear film instability, hyperosmolarity, inflammation, and ocular surface damage. Its prevalence continues to increase, particularly due to modern lifestyle factors such as prolonged screen exposure and contact lens use, as well as systemic comorbidities including diabetes mellitus, hypertension, dyslipidemia, and rosacea.

Methods: This observational analytic study used a cross-sectional design and was conducted at the Internal Medicine Outpatient Clinic of RSI UNISMA Malang from October to November 2025. A total of 305 respondents meeting the inclusion criteria were recruited using accidental sampling. Primary data were collected using a risk factor questionnaire and the Ocular Surface Disease Index (OSDI). Statistical analysis was performed using the Chi-square test to assess the association between risk factors and the occurrence of DES, while Spearman correlation analysis was used to evaluate the relationship between comorbidities and DES severity.

Results and Discussion: Among 305 respondents, 177 individuals were diagnosed with DES, yielding a prevalence of 58%. The severity distribution consisted of 23.3% mild, 18.7% moderate, and 16.1% severe DES. Significant associations were found between DES occurrence and age ($p = 0.000$), occupation ($p = 0.000$), and screen exposure duration ($p = 0.002$). Mean OSDI scores increased with the number and type of comorbidities, suggesting that systemic risk factors may contribute to more severe DES. Spearman correlation analysis showed significant associations between DES severity and diabetes mellitus ($r = -0.380$; $p = 0.000$), hypertension ($r = -0.233$; $p = 0.000$), dyslipidemia ($r = -0.130$; $p = 0.023$), and rosacea ($r = -0.203$; $p = 0.000$).

Conclusion: DES is highly prevalent among internal medicine outpatients at RSI UNISMA and is significantly associated with metabolic comorbidities and screen exposure duration. Early detection and patient education are essential to prevent symptom progression and improve quality of life.

Keywords: *Dry Eye Syndrome*, *Ocular Surface Disease Index*, comorbidities, screen time, contact lens.

*Correspondence : dr. Ariani Ratri Dewi, Sp. M

Address Jl. MT Haryono 193 Malang, Jawa Timur Indonesia 65144. Telp (0341)57892

Email : arianiretridewi@unisma.ac.id

INTRODUCTION

Dry eye syndrome (DES) is a disorder of the tear film that can lead to ocular surface damage (Rahardjo *et al.*, 2024). The prevalence of this condition continues to rise in association with modern lifestyle changes. The TFOS DEWS II Report (2017) estimates 5%–50% global DES prevalence, with a notable increase observed among younger populations who engage in intensive digital device use and individuals with systemic diseases (Kunboon *et al.*, 2024). Clinical manifestations of DES commonly include irritation, excessive tearing, burning sensation, foreign body sensation, itching, photophobia, blurred vision, redness, mucous discharge, increased blink frequency, ocular fatigue, and symptoms that worsen in the late afternoon or evening (Britten-Jones *et al.*, 2024).

The etiology of DES is multifactorial, involving not only local and environmental determinants but also systemic factors. Individuals with metabolic or chronic inflammatory comorbidities—such as diabetes mellitus, hypertension, dyslipidemia, and rosacea—are at increased risk. Additionally, contact lens wear is one of the increasingly recognized risk factors for DES. Contact lenses may destabilize the tear film through both mechanical and biochemical pathways, including decreased lipid secretion from the Meibomian glands, increased tear evaporation, and inflammatory responses on the ocular surface (Craig *et al.*, 2020). Screen exposure has also emerged as a major contributor to DES. Intensive use of digital devices can reduce blink frequency by 60–80% compared to normal conditions, thereby accelerating tear evaporation and causing ocular surface dryness (Palavets & Rosenfield, 2019).

Accurate data regarding the occurrence of DES and its related risk factors are crucial for designing appropriate preventive measures and optimizing clinical management. As a teaching hospital for the Faculty of Medicine, Universitas Islam Malang, located in a densely populated area with a high patient load, RS Islam UNISMA requires updated epidemiological data to enhance the quality of its services. Thus, this study was done to assess dry eye disease incidence and risk factors in the patient population of the hospital.

METHODOLOGY

Study Design, Setting, and Duration

This study employed an analytical observational design with a cross-sectional approach. This design was chosen to examine the relationship between independent variables (comorbidities, screen time duration, and contact lens use) and the dependent

variable (presence and severity of dry eye syndrome) at a single point in time without any intervention on the study subjects. The research was conducted at the Internal Medicine Clinic of RS Islam UNISMA Malang. The study period spanned from October to November 2025, encompassing preparation, data collection, analysis, and reporting stages.

Sampling and Research Procedures

Participants fulfilling the inclusion criteria were recruited using accidental sampling. All outpatients of the Internal Medicine Clinic of RS Islam UNISMA Malang during the study period were included in the study until the needed sample size achieved. The sample size was determined using the formula for estimating a population proportion with an unknown total population size, assuming a prevalence of 27.5% (Perdami, 2021), a confidence level of 95%, and a precision of 5%, as follows:

$$\begin{aligned} Z^2 P(1 - P) \\ n &= \frac{d^2}{1,96^2 \cdot 0,275(1 - 0,275)} \\ n &= \frac{0,05^2}{1,96^2 \times 0,199} \\ n &= \frac{0,05^2}{0,764} \\ n &= \frac{0,0025}{0,0025} \\ n &= 305 \end{aligned}$$

Where:

- p = estimated prevalence from previous studies = 0.275 (Perdami, 2021)
- d = margin of error (absolute precision) = 0.05
- Z = Z-value at 95% confidence level = 95% (1.96)

The estimated minimum required sample size was 305 respondents.

Data were acquired using a two-part structured questionnaire. The first part was the *Ocular Surface Disease Index* (OSDI) questionnaire, which includes three subscales: ocular symptoms (3 items), visual function related to daily activities (6 items), and environmental triggers (3 items). The total OSDI score was obtained by summing the responses and then categorizing the severity of dry eye as follows: Normal (0–12), Mild (13–22), Moderate (23–32) and Severe (33–100). The second part of the questionnaire assessed risk factors, including comorbidities, duration of screen time, and contact lens use. Respondents completed the questionnaire manually using printed forms and pens. Alternatively, participants who preferred a digital format were provided with access through a QR code or a Google Form link for convenience.

The research process began with administrative preparation and ethical clearance. Validity and reliability testing of the questionnaire was conducted prior to data collection. Primary data were then collected from respondents who met the inclusion criteria at the Internal Medicine Clinic of RS Islam UNISMA Malang. The collected data were subsequently processed and analyzed. The final stage included data interpretation, discussion, and preparation of the research report. The Health Research Ethics Committee of Universitas Islam Malang accepted this study under certificate 37/KEPK/RSI-U/VI/2025.

Data Analysis Techniques

The collected data were first examined for completeness, followed by coding and processing using SPSS software version 27. Statistical analysis was performed using the Chi-square test to determine the association between risk factors (comorbidities, screen time duration, and contact lens use) and the incidence of dry eye syndrome (DES), followed by Spearman correlation test to evaluate the relationship between comorbidities and DES severity.

RESULTS AND DISCUSSION

Respondent Characteristics

The characteristics of the respondents are presented in **Table 1**. A total of 305 participants were included in this study. The majority of respondents were adults aged 18–59 years (68.2%). In terms of gender distribution, females (56.4%) outnumbered males (43.6%).

Regarding occupational status, most respondents were housewives (23.3%). A large proportion of participants reported having systemic diseases, with hypertension being the most prevalent comorbidity (59.7%), followed by diabetes mellitus (36.4%), dyslipidemia (33.8%), and rosacea (10.5%).

In terms of screen time duration as a risk factor, most respondents were frequently exposed to digital screens, with 55.1% spending ≤ 6 hours per day, while 124 respondents (40.7%) reported screen exposure of > 6 hours per day. The last risk factor assessed was contact lens use, where 285 respondents (93.4%) stated that they had never used contact lenses.

Table 1 Respondent Characteristics

Respondent Characteristics	n	%
Age		
10-18 years	1	0,3
18-59 years	208	68,2
>60 years	96	31,5
Sex		
Male	133	43,6
Female	172	56,4
Occupational		
Student	47	15,4
Self employed	69	22,6
Private employee	31	10,2
Civil servants	23	7,5
Housewife	71	23,3
Not working	64	21,0
Duration screen time		
Yes (≤ 6 hours/day)	168	55,1
Yes (> 6 hours/day)	124	40,7
No	13	4,3
Duration Lens Contact		
Yes (< 4 hours/day)	8	2,6
Yes (> 4 hours/day)	12	3,9
No	285	93,4
Comorbid Diabetes		
Yes	111	36,4
No	194	63,6
Comorbid Hypertension		
Yes	182	59,7

No	123	40,3
Comorbid Dyslipidemia		
Yes	103	33,8
No	202	66,2
Comorbid Rosacea		
Yes	32	10,5
No	273	89,5

Dry Eye Syndrome Prevalence

This study used the *Ocular Surface Disease Index* (OSDI) questionnaire to assess the presence and severity of dry eye syndrome (DES). Table 2

shows that 42.0% of respondents had normal OSDI scores (0–12). Meanwhile, mild severity was observed in 23.3% of participants, moderate severity in 18.7%, and severe cases in 16.1% of respondents.

Table 2 Dry Eye Syndrome Prevalence

OSDI Score	n	%
Normal (0-12)	128	42,0
Dry eye	(177)	(48)
Mild (13-22)	71	23,3
Moderate (23-32)	57	18,7
Severe (33-100)	49	16,1
Total	305	100

Bivariate Test

Bivariate analysis was performed to determine whether respondent characteristics were significantly associated with the incidence of *Dry Eye Syndrome* (DES), as classified using the Ocular Surface Disease

Index (OSDI) score (0–12 = normal; ≥ 13 = dry eye). Chi-square testing showed that age and occupation were significantly associated with DES incidence ($p < 0.001$). In contrast, sex was not significantly associated with DES incidence ($p = 0.331$).

Table 3. Association between Respondent Characteristic and Dry Eye Incidence

Respondent Characteristics	Dry Eye Status		Chi square p value
	Normal	Dry Eye	
Age			0,000
10-18 years	1	0	
18-59 years	109	99	
>60 years	18	78	
Sex			0,331
Male	48	85	
Female	80	92	
Occupational			0,000
Student	33	14	
Self employed	28	41	
Private employee	14	17	
Civil servants	10	13	
Housewife	33	38	
Not working	10	54	
Screen time			0,002
≤ 6 hours/day)	54	114	
> 6hours/day)	67	57	
Lens Contact			0,643
Yes	9	11	
No	128	71	

The respondent distribution showed that most participants were aged 18–59 years, followed by those aged >60 years. Age was significantly associated with DES incidence in this study, supporting the theory that increasing age contributes to elevated oxidative stress, which may impair lacrimal and Meibomian gland function and reduce tear production and stability (Hidayah & Dewi, 2025).

Although previous studies reported that females are more susceptible to DES due to hormonal influences, particularly reduced androgen levels after menopause affecting goblet cell function and mucin production (Hanan *et al.*, 2024), our findings did not show a statistically significant association between sex and DES incidence. Dry Eye Syndrome is influenced by multiple interacting factors such as age, comorbidities, environmental exposure (air conditioning, screen time, lens contact), and other medical conditions; therefore, the effect of a single factor such as sex may not appear statistically significant when other factors are more dominant within a specific study population.

Occupation was also significantly associated with DES incidence. In this study, the largest occupational group was housewives (23.3%). Daily activities that involve prolonged near work or visual demand, including screen exposure, sewing, and

reading, have been associated with increased DES risk (Deo & Nagrale, 2024). DES prevalence is also reported to be high among office workers due to extended screen time and frequent exposure to air-conditioned environments (Patil & Nalawade, 2023). Additionally, outdoor workers may experience increased risk due to environmental exposure such as wind, sunlight, and air pollution (Bhatnagar *et al.*, 2019). These patterns may explain the significant association observed across occupational categories.

Screen exposure duration was another significant factor associated with DES incidence ($p = 0.002$). This finding is consistent with evidence suggesting that prolonged digital device use reduces blink frequency and increases tear film evaporation, thereby exacerbating ocular surface dryness (Ainul *et al.*, 2025).

In contrast, contact lens use was not significantly associated with DES incidence ($p = 0.643$). This may be influenced by the fact that most respondents (93.4%) reported no contact lens use, while only a small proportion used contact lenses for ≤ 4 hours/day (2.6%) or > 4 hours/day (3.9%). Fasya *et al.* (2022) reported that dry eye symptoms can occur in both contact lens wearers and non-wearers; however, prolonged lens wear may still aggravate discomfort and ocular surface instability.

Table 4. Distribution of Dry Eye Syndrome Severity Based on the Number of Comorbidities among Internal Medicine Outpatients at RSI UNISMA (n = 305)

Number Comorbidities		Severity Levels of Dry Eye Syndrome				Total
		Normal	Mild	Moderate	Severe	
None of comorbidities studied	n	42	5	2	2	52
	(%)	82,7	9,6	3,8	3,8	100%
One comorbid	n	63	25	18	14	120
	(%)	52,5	20,8	15,0	11,7	100%
Two or more comorbidities	N	22	41	37	33	133
	(%)	16,5	30,8	27,8	24,8	100%
Total	n	128	71	57	49	305
	(%)	42,0	23,3	18,7	16,1	100%

Table 4 presents the distribution of *Dry Eye Syndrome* (DES) severity according to the number of comorbidities among internal medicine outpatients at RSI UNISMA. Respondents without comorbidities ($n = 52$) were predominantly classified as normal (82.7%), with only a small proportion experiencing mild (9.6%), moderate (3.8%), or severe DES (3.8%). Among those with one comorbid condition ($n = 120$), the percentage of normal classification decreased to 52.5%, while mild, moderate, and severe DES increased to 20.8%, 15.0%, and 11.7%, respectively. The most pronounced shift was observed in

respondents with two or more comorbidities ($n = 133$), where only 16.5% were normal and most experienced DES, particularly in the mild (30.8%), moderate (27.8%), and severe (24.8%) categories.

This pattern suggests that a greater comorbidity burden is associated with increased DES severity, likely due to the combined effects of systemic inflammation, microvascular dysfunction, and disruption of lacrimal and Meibomian gland function. Consistent with these findings, Chi-square analysis demonstrated a statistically significant association between the number of comorbidities and DES

incidence ($p < 0.001$), indicating that patients with multiple comorbidities are more likely to develop

DES and experience more severe symptoms.

Correlation Test

Table 5. Association between Comorbids with Dry Eye Incidence and Severity

Risk Factor	Dry Eye Syndrome Severity Level				Chi-square p-value	Spearman	
	Normal	Mild	Moderate	Severe		r (rho)	Sig.
Diabetes mellitus					0,000	-,380	,000
Yes	20	29	32	30			
No	108	42	25	19			
Hypertension					0,000	-,233	,000
Yes	55	51	42	34			
No	73	20	15	15			
Dyslipidemia					0,022	-,130	,023
Yes	31	29	25	18			
No	97	42	32	31			
Rosacea					0,002	-,203	,000
Yes	6	8	6	12			
No	122	63	51	37			

**Highly significant at the 0.01 level → 99% confidence level (very strong)

*Significant at the 0.05 level → 95% confidence level (moderately strong)

A considerable proportion of respondents presented with systemic comorbidities, with hypertension being the most common (182 respondents, 59.7%), followed by diabetes mellitus (111 respondents, 36.4%), dyslipidemia (103 respondents, 33.8%), and rosacea (32 respondents, 10.5%). These systemic conditions are clinically relevant because they may contribute to the development and worsening of Dry Eye Syndrome (DES) through several mechanisms, including microvascular dysfunction, chronic low-grade inflammation, and disruption of normal tear film composition and stability.

As shown in Table 5, Chi-square analysis demonstrated that each comorbidity was significantly associated with DES incidence and severity. Significant associations were observed for diabetes mellitus ($p < 0.001$), hypertension ($p < 0.001$), dyslipidemia ($p = 0.022$), and rosacea ($p = 0.002$). In general, respondents with comorbidities tended to demonstrate a higher proportion of DES cases across mild to severe categories compared to those without these conditions. Additionally, cumulative systemic disease burden also appeared to play an important role, as respondents with two or more comorbidities were more frequently classified within the mild-to-severe DES categories, supporting a significant relationship between comorbidity burden and DES occurrence ($p < 0.001$).

To further assess the relationship between comorbid risk factors and DES severity, Spearman

correlation analysis was performed (Table 5). The results showed statistically significant correlations between DES severity and all systemic variables studied: diabetes mellitus, hypertension, dyslipidemia, and rosacea. The correlation coefficients were consistently negative, which most likely reflects the coding structure used in this dataset (e.g., binary categories such as “Yes/No” and ordinal severity classification), rather than indicating a protective effect. Among all comorbidities, diabetes mellitus demonstrated the strongest correlation with DES severity ($r = -0.380$; $p < 0.001$), followed by hypertension ($r = -0.233$; $p < 0.001$) and rosacea ($r = -0.203$; $p < 0.001$). Dyslipidemia also showed a statistically significant correlation, although with weaker strength ($r = -0.130$; $p = 0.023$). Overall, these findings suggest that metabolic and inflammatory comorbidities—particularly diabetes mellitus—are closely associated with increased DES severity in internal medicine outpatients.

Despite demonstrating statistically significant associations between several metabolic comorbidities and the incidence and severity of *Dry Eye Syndrome* (DES), this study has several limitations that should be considered when interpreting the findings. First, the cross-sectional design limits causal inference, meaning that the observed associations cannot confirm whether systemic comorbidities directly contributed to DES development or whether both conditions coexist due

to shared underlying mechanisms. Second, the diagnosis and severity classification of DES relied solely on the *Ocular Surface Disease Index* (OSDI), which is a subjective, symptom-based instrument and may not fully represent objective ocular surface conditions. Additionally, several potential confounding factors were not assessed in detail, including medication type and duration, dietary habits, viewing distance from digital devices, rest intervals during screen exposure, and environmental humidity. The use of accidental sampling in a single outpatient clinic setting may also limit generalizability to broader populations. Therefore, future research should incorporate objective clinical assessments such as the Schirmer test, *Tear Break-Up Time* (TBUT), and tear film evaluation, expand the range of independent variables, and consider longitudinal or interventional designs, particularly educational interventions, to strengthen evidence regarding risk factors and to guide effective prevention and management strategies for DES.

CONCLUSION

Based on the results of the study, the following conclusions were drawn:

1. The prevalence of Dry Eye Syndrome among outpatients attending the Internal Medicine Outpatient Clinic at RSI UNISMA was 58%.
2. There was a statistically significant association between comorbidities and the prevalence of Dry Eye Syndrome among patients at the Internal Medicine Outpatient Clinic of RSI UNISMA.
3. There was a statistically significant association between screen time duration and the prevalence of Dry Eye Syndrome among patients at the Internal Medicine Outpatient Clinic of RSI UNISMA.

RECOMMENDATION

Based on the findings and experiences obtained during the implementation of this study, several aspects were identified that could be improved to enhance similar research in the future. Therefore, the following recommendations are proposed:

1. Future studies are recommended to incorporate objective measurements such as the Schirmer test, *Tear Break-Up Time* (TBUT), and microscopic analysis of the tear film to complement and strengthen data obtained from subjective questionnaire-based assessments.

2. Further research should expand the range of independent variables, particularly factors influencing *Dry Eye Syndrome*, including dietary history, medication use, viewing distance from digital devices, and other relevant determinants.
3. Interventional studies focusing on educational programs for the prevention and management of *Dry Eye Syndrome* are also important to investigate, as they may contribute to preventive efforts and improvement of patients' quality of life.

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