Impact of Ocular Surface Symptoms on Quality of Life in a United States Veterans Affairs Population

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• PURPOSE: To evaluate the impact of ocular surface symptoms on quality of life in a veteran population receiving eye care services.

• DESIGN: Cross-sectional survey study.

• METHODS: SETTING: Miami Veterans Affairs Medical Center (VAMC). PATIENT POPULATION: Patients seen at the eye clinic between June and August 2010 were asked to fill out the Dry Eye Questionnaire 5 (DEQ5) and the Impact of Dry Eye on Everyday Life (IDEEL) questionnaire. MAIN OUTCOME MEASURES: Correlation between ocular surface symptoms and functionality.

• RESULTS: Four hundred eighty-nine patients elected to fill out the DEQ5 questionnaire (36% response rate). The mean age of respondents was 66 years (standard deviation 12). Ninety-four percent were male; 62% were white and 37% were black. Using the DEQ5 as a surrogate measure of ocular surface symptoms, 65% of respondents reported at least mild ocular surface symptoms (DEQ5 ≥6) and 27% of them reported severe symptoms (DEQ5 ≥12). Black subjects had a 2-fold increased risk of severe symptoms compared to white subjects (odds ratio 2.06, 95% confidence interval 1.33-3.19). Several medications were associated with a significantly increased risk of severe symptoms, including glaucoma medications (1.7-fold increase), antidepressants (2.3-fold increase), and antihistamines (2.1-fold increase). There was an inverse correlation between DEQ5 and IDEEL scores with regard to ability to perform activities of daily living ($n = 391$, $r = -0.54$, $P < .001$), emotional well-being ($n = 386$, $r = -0.63$, $P < .001$), and the ability to work ($n = 205$, $r = -0.57$, $P < .001$). Fifty percent of patients with severe symptoms had documentation that their symptoms were addressed during the visit.

• CONCLUSION: Severe ocular surface symptoms reduce the quality of life of Miami VAMC veterans. Eye care professionals should be vigilant in eliciting ocular surface complaints from their patients. (Am J Ophthalmol 2012;153:1061–1066. © 2012 by Elsevier Inc. All rights reserved.)

DRY EYE SYNDROME (DES) HAS GAINED RECOGNITION as a public health concern because of its high prevalence and morbidity.[1–9] Several studies have demonstrated that the symptoms associated with DES, which include irritation, foreign body sensation, and blurred vision, interfere with the ability to work and carry out daily functions.[10–12] A study using the Impact of Dry Eye Living Questionnaire (IDEEL), a disease-specific instrument, revealed that severe DES symptoms correlated with difficulties in physical, social, and mental functioning.[13] A cross-sectional study of Women's Health Study (WHS) and Physicians' Health Study (PHS) participants found that individuals with DES were more likely to report problems with reading, computer work, and driving compared to those not affected with the disease.[11] Such difficulties translate into a relatively lower health-related quality of life (HRQoL) compared to the general population—patients with severe dry eye symptoms have HRQoL scores in the range of conditions like class III/IV angina.[12]

We have previously demonstrated that DES is a prevalent condition in the Miami Veterans Affairs (VA) population.[14] The goal of the current study was to evaluate the morbidity associated with ocular surface symptoms in this population, as well as to assess accuracy of diagnosis and treatment. The Miami VA population, which is predominantly male with a large Hispanic population, differs from previously studied DES populations, which have included more women and white subjects.[10,12,13] Furthermore, veterans have a higher prevalence of comorbidities known to be associated with DES, including depression and post-traumatic stress disorder.[14]

As the IDEEL questionnaire has been previously used to determine the burden of disease on vision-related quality of life in population-based samples,[10,11,13] our goal was to use this same metric to evaluate the impact of ocular surface symptoms in a clinic-based population seen for a wide range of ophthalmic conditions. Finally, to address the knowledge gap of how frequently those with severe ocular surface symptoms are diagnosed appropriately, we assessed the documentation accuracy of eye care professionals with regard to identifying and treating patients with severe symptoms.

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TABLE 1. Demographic Information of Dry Eye Questionnaire 5 Responders and Nonresponders (Sampled Bimonthly)

Patient Characteristic	DEQ5 Responders	DEQ5 Nonresponders	*P* Value
Age, mean ± SD (n)	66 ± 12 (465)	67 ± 11 (143)	.21
Sex, % male (n)	94% (450)	94% (134)	.85
% female (n)	6% (28)	6% (9)	
Race, % white (n)	62% (263)	60% (83)	.89
% black (n)	37% (157)	39% (54)	
% other (n)	0.9% (4)	1% (4)	
Ethnicity, % Hispanic (n)	15% (64)	15% (21)	.94
% not Hispanic (n)	85% (377)	85% (121)	

DEQ5 = Dry Eye Questionnaire 5; SD = standard deviation.

METHODS

• **STUDY POPULATION:** Patients seen in VA clinics consist of ex-military personnel but do not include or represent all former military recruits. The Miami VA eye clinic serves veterans with specific eye problems along with those needing surveillance because of medical conditions (eg, diabetes). Patients seen in the Miami VA eye clinic (by an ophthalmologist or optometrist) between June and August 2010 were invited to complete 2 questionnaires at the time of their visit, the Dry Eye Questionnaire 5 (DEQ5) and the Impact of Dry Eye Living Questionnaire (IDEEL). Of 1348 patients seen in the Miami VA eye clinic during the 3-month period, 36% (489) elected to fill out the DEQ5. To evaluate potential biases associated with incomplete patient ascertainment, demographic characteristics of DEQ5 nonresponders were collected bimonthly (every other Friday). No demographic differences were found between this group and those who elected to fill out the questionnaire (Table 1). Of 489 respondents who filled out the DEQ5 questionnaire, 80% (391) elected to fill out all or part of the IDEEL quality-of-life questionnaire.

• **DETERMINATION OF SEVERITY OF OCULAR SURFACE SYMPTOMS:** The DEQ5 (Supplemental Figure, available at AJO.com) is a validated questionnaire consisting of 5 questions regarding the presence and severity of eye discomfort, dryness, and tearing over a 1-month recall period.[15] The score ranges from 0 to 22, with 0 reflecting no ocular surface symptoms and 22 reflecting a large number of symptoms. Per previously established guidelines, mild to moderate ocular surface symptoms was defined as a DEQ5 score between 6 and 11 and severe ocular surface symptoms was defined as a score of 12 or greater.[15]

• **MEASUREMENT OF QUALITY OF LIFE:** The IDEEL is a validated questionnaire that assesses QoL specific to DES.[13] The 27 item QoL module is divided into 3 sections, which measure daily activity limitations, emotional well-being, and work limitations. For each of these 3 domains, a scale score is calculated between 0 (representing total impairment) and 100 (representing no impairment).

• **DATA COLLECTION:** Data from the 2 questionnaires were collected at the time of the respondents' visit and entered into a standardized database. The Veterans Affairs administrative database was used to collect other data including demographic information (age, sex, race, ethnicity), past ocular and medical history (by International Classification of Disease codes [ICD9]), medication use (by pharmacy codes), and ocular examination findings from the day the patient filled out the questionnaires.

• **MAIN OUTCOME MEASURES:** The main outcome measures included ocular surface symptoms and their associated impact on functionality, and the frequency of symptom or treatment documentation in patients with severe ocular surface symptoms.

• **STATISTICAL ANALYSIS:** All statistical analyses were performed using SPSS 18.0 (SPSS Inc, Chicago, Illinois, USA) statistical package. Logistic regression analysis (using the presence of severe ocular surface symptoms [DEQ5 $\geq$12] as the dependent variable) was used to evaluate the effect of various factors on symptoms. This methodology was also used to evaluate which factors affected the presence of documentation in patients with severe ocular surface symptoms. The correlation between ocular symptoms (DEQ5 score) and quality of life (IDEEL scores) was evaluated by the Pearson coefficient. QoL scores between the groups (severe vs no severe symptoms) were compared using the independent Student *t* test. Multiple linear regression analyses were performed to assess if the associations of the DEQ5 with each IDEEL domain remained after adjusting for demographic and clinical factors.

RESULTS

• **RESPONDENTS' POPULATION:** Four hundred eighty-nine patients elected to fill out the DEQ5 questionnaire at the time of their eye clinic visit, with no statistically significant differences on select sociodemographic characteristics between study participants and those who did not complete the questionnaire (Table 1). Mean respondent age was 66 years (range 23 to 95 years, standard deviation [SD] 12). Ninety-four percent were male; 62% were white and 15% were Hispanic. Among respondents with available clinical histories in the VA administrative database, 28% (133/475) carried a diagnosis of dry eye syndrome or blepharitis, or had a history of artificial tear use.

TABLE 2. Univariable Associations Between Demographic and Clinical Factors and Severe Ocular Surface Symptoms[a] in Patients Seen at the Miami Veterans Affairs Medical Center Eye Clinic

Factor	Number	Frequency	OR[b] (95% CI)	*P* Value
Demographics				
Age, by decade			0.85 (0.71–1.02)	.07
Sex, male	118	26%	1	.14
female	11	39%	1.8 (0.83–4.00)	
Race, white	57	22%	1	.001
black	57	36%	2.06 (1.33–3.19)	
Ethnicity, Hispanic	19	30%	1	.63
non-Hispanic	101	27%	0.87 (0.48–1.55)	
POH				
DES/blepharitis, no	72	21%	1	<.001
yes	58	44%	2.9 (1.92–4.52)	
Postoperative visit,[c] no	17	27%	1	.93
yes	115	27%	0.98 (0.54–1.77)	
Ocular meds				
Glaucoma medication, no	86	24%	1	.02
yes	46	35%	1.69 (1.09–2.60)	
Prostaglandin, no	94	24%	1	.01
yes	38	37%	1.82 (1.14–2.89)	
Dorzolamide-timolol, no	103	25%	1	.006
yes	29	40%	2.06 (1.22–3.46)	
Brimonidine, no	108	25%	1	.004
yes	24	43%	2.25 (1.27–4.00)	
Beta blocker, no	100	25%	1	.02
yes	32	37%	1.80 (1.10–2.94)	
PMH				
Depression, no	76	25%	1	.12
yes	56	31%	1.39 (0.92–2.08)	
PTSD, no	116	26%	1	.40
yes	16	32%	1.31 (0.70–2.46)	
Systemic meds				
Anti-BPH medication, no	89	25%	1	.19
yes	43	31%	1.33 (0.86–2.06)	
Anti-anxiety medication, no	106	26%	1	.17
yes	26	33%	1.44 (0.86–2.42)	
Antidepression medication, no	85	23%	1	<.0005
yes	47	41%	2.31 (1.48–3.59)	
Antihistamine, no	80	23%	1	.001
yes	52	38%	2.11 (1.38–3.24)	

BPH = benign prostatic hyperplasia; CI = confidence interval; DES = dry eye syndrome; meds = medications; OR = odds ratio; PMH = past medical history; POH = past ocular history; PTSD = post-traumatic stress disorder.

[a]Defined as a Dry Eye Questionnaire 5 score of 12 or greater.

[b]An odds ratio greater than 1 represents an increased likelihood of severe ocular.surface symptoms.

[c]Within 1 month of surgery.

• **ASSOCIATION BETWEEN OCULAR SURFACE SYMPTOMS AND PATIENT FACTORS:** Sixty-five percent of respondents seen at the Miami VA over a 3-month period reported having ocular surface symptoms at the time of their eye clinic visit (defined as a score of 6 or greater on the DEQ5). Twenty-seven percent of respondents reported the presence of severe symptoms (defined as a score of 12 or greater on the DEQ5). Black race was associated with a 2-fold increased risk of having severe symptoms compared to white race (odds ratio [OR] 2.06, confidence interval [CI] 1.33–3.19, *P* value .001) (Table 2). Likewise, respondents with a documented diagnosis or previous treatment

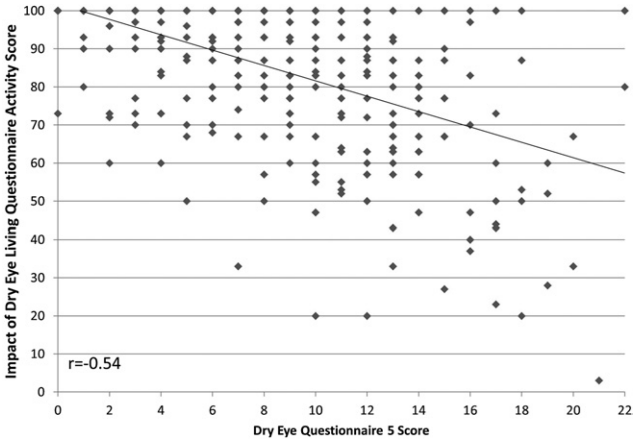

FIGURE 1. An inverse correlation is seen between ocular surface symptoms (as assessed by the Dry Eye Questionnaire 5) and the ability to perform daily activities.

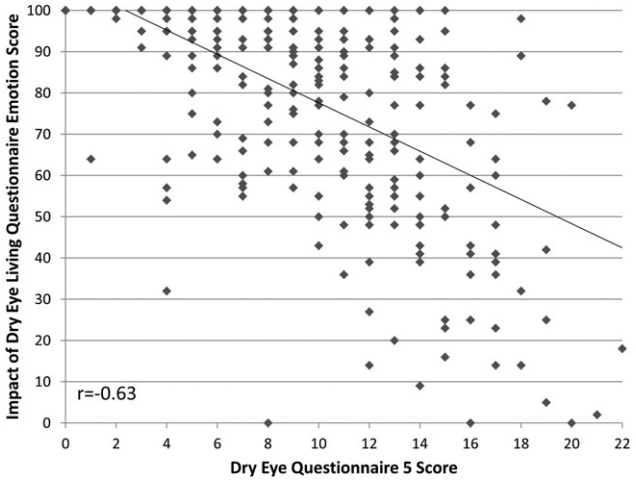

FIGURE 2. An inverse correlation is seen between ocular surface symptoms (as assessed by the Dry Eye Questionnaire 5) and emotional well-being.

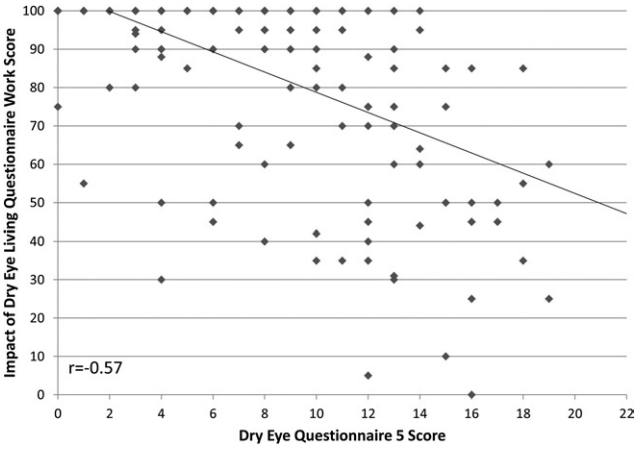

FIGURE 3. An inverse correlation is seen between ocular surface symptoms (as assessed by the Dry Eye Questionnaire 5) and the ability to work.

TABLE 3. Univariable Association Between Demographic and Clinical Factors and Presence of Medical Record Documentation in Patients With Severe Ocular Surface Symptoms[a] Seen at the Miami Veterans Affairs Medical Center Eye Clinic[c]

Demographic Factor	Number	Frequency	OR[b] (95% CI)	*P* Value
Age, by decade			1.30 (0.97–1.74)	.08
Sex, male	61	54%	1	.10
female	3	27%	0.33 (0.08–1.29)	
Race, white	31	54%	1	.57
black	28	49%	0.81 (0.39–1.69)	
Ethnicity, Hispanic	11	58%	1	.55
non-Hispanic	51	51%	0.74 (0.28–2.00)	
Use of glaucoma medication, no	42	52%	1	
yes	22	48%	0.85 (0.41–1.76)	.66
Postoperative visit,[c] no	59	54%	1	
yes	5	29%	0.36 (0.11–1.09)	.07

CI = confidence interval; OR = odds ratio.
[a]Defined as a Dry Eye Questionnaire 5 score of 12 or greater.
[b]An odds ratio greater than 1 represents an increased likelihood of having the ocular.surface symptoms documented.
[c]Within 1 month of surgery.

for DES or blepharitis had a 3-fold risk of having severe symptoms (CI 1.92–4.52, *P* value <.001). The use of any glaucoma medication was associated with a 1.7 times higher risk of severe symptoms (CI 1.09-2.60, *P* value .02), with the highest risk (a 2.25-fold increase) associated with brimonidine use. Furthermore, an increasing number of glaucoma medications were associated with an increased percentage of severe symptoms (none: 24%, 1 drop: 28%, 2 drops: 31%, 3 drops: 30%, 4 drops: 48%, linear-trend *P* value .002). In a multivariable analysis considering the various glaucoma medications, brimonidine use remained the only significant predictor of severe symptoms (OR 2.26, 95% CI 1.27-4.0, *P* value .005). The use of antidepressants and antihistamines remained significant predictors of severe symptoms.

• **ASSOCIATION BETWEEN OCULAR SURFACE SYMPTOMS AND QUALITY OF LIFE:** Ocular surface symptoms were found to negatively impact QoL as there was an inverse correlation between DEQ5 scores and IDEEL scores with regard to the ability to perform activities of daily living (n = 391, r = −0.54, *P* < .001) (Figure 1), emotional well-being (n = 386, r = −0.63, *P* < .001)

(Figure 2), and the ability to work (n = 205, r = −0.57, $P < .001$) (Figure 3).

There were significant differences in IDEEL scores between respondents with and without severe ocular surface symptoms with regard to performing activities (mean, 72 ± 22 vs 91 ± 14), emotional well-being (mean, 62 ± 28 vs 92 ± 15), and capacity to work (mean, 62 ± 26 vs 93 ± 15), $P < .0001$ for all groups. In a multivariable linear regression analysis, DEQ5 score remained the most significant predictor of functional impairment for all IDEEL domains (beta range −8.2 to −13.7, $P < .0001$) when considering demographic factors, use of glaucoma drops, and history of DES or blepharitis.

• **ASSOCIATION BETWEEN PATIENT SUBJECTIVE SYMPTOMS AND EYE CARE PROFESSIONAL DOCUMENTATION:** Documentation of the eye care visit on the day of questionnaire completion was available in 470 out of the 489 respondents (96%). Of the 127 respondents who complained of severe ocular surface symptoms on the DEQ5, 50% had medical record documentation that their symptoms were documented or addressed during their eye care visit. Respondents seen within 1 month of having eye surgery were less likely to have their symptoms addressed than those being seen for another ocular indication ($P = .07$) (Table 3).

DISCUSSION

THE GOAL OF THIS STUDY WAS TO ASSESS HOW OCULAR surface symptoms impact the QoL of a Miami veteran eye care population. We found that the presence of ocular surface symptoms negatively impacted the performance of daily activities, emotional well-being, and capacity to work. Furthermore, while this was not designed as a prevalence study, we found that a significant proportion (27%) of patients who elected to fill out the questionnaires reported having severe symptoms. Even under the unlikely scenario in which all study nonresponders had DEQ5 scores less than 12, the prevalence of severe ocular surface symptoms in our eye clinic population would be 10%, indicating that a substantial proportion of patients at our VA ocular clinic present with severe symptoms that have a substantial adverse impact on QoL. This is important as DES was previously believed to affect primarily women. Our findings in a predominantly male population highlight the fact that ocular surface symptoms are present in both men and women and that further research is needed to understand the pathophysiology and manifestations of disease in both sexes. Interestingly, older age, one of the strongest risk factors for DES, was not found to significantly correlate with severe ocular surface symptoms in our study. This likely reflects the clinic-based population in our study compared to population-based surveys in others.[6,16,17]

Similar to the literature, the use of certain medications, namely glaucoma medications, antidepressants, and antihistamines, increased the risk of severe ocular surface symptoms.[6,14,18,19] This may have significance in veterans given the high burden of mental illness in this population. Thirty-eight percent of veterans in this study carried a diagnosis of depression compared to a prevalence of 7% in the US population.[20]

Our findings compare favorably to those found in the literature. Rajagopalan and associates administered 2 generic health-related QoL instruments (SF-36 and EQ-5D) and the IDEEL questionnaire to 210 patients with the aim of evaluating which metric best distinguished between different levels of dry eye severity. While the primary goal of that study was not to evaluate the impact of symptoms on QoL, patients without DES scored significantly higher in all 3 domains (activity limitations, emotional disturbances, and work impact) compared to Sjögren syndrome (SS) and non-SS DES patients. In fact, our patients with severe ocular surface symptoms had QoL scores in the range of the SS DES patients (range 69–71).[13] Miljanovic and associates examined how the presence of DES impacted functioning in 385 participants in the WHS and 204 participants in the PHS. Her group found that those with self-reported DES were approximately 3 times more likely to report difficulties with reading (OR 3.64, 95% CI 2.45–5.40), professional work (OR 3.49, 95% CI 1.72–7.09), computer use (OR 3.37, 95% CI 2.11–5.38), television watching (OR 2.84, 95% CI 1.05–7.74), and daytime driving (OR 2.80, 95% CI 1.58–4.96) compared to those without DES.[11]

As with all studies, our methodology has limitations that need to be considered when interpreting the study results. This study relied on patient self-report of ocular surface symptoms and associated limitations in physical and mental functioning. In this manner, it is probable that not all functional limitations noted by patients were attributable to DES. For this reason, our study examined associations between symptoms and QoL without the ability to comment on the specific etiology of symptoms. Another study limitation is that a small proportion of patients elected to fill out the questionnaire (489 of 1348 potential patients). As we anticipated this problem, we purposefully chose outcome measures that were not directly dependent on response rate. However, we acknowledge that the correlation between symptoms and QoL may have been different in nonresponders compared to responders. Furthermore, we do not have complete data on nonresponders with regard to medical and ocular history and are therefore not able to comment on potential biases between the groups. Also, as we only assessed symptoms and functionality in veterans with eye care appointments, our data are only generalizable to veteran populations receiving ocular care services. Finally, our estimates of documentation accuracy

may be inflated as it is possible that treating physicians elicited and addressed patients' ocular surface symptoms but did not document the discussion and treatment in the clinical record.

With these limitations in mind, this study is the first to specifically study the impact of ocular surface symptoms in a veteran population. We found that a large proportion of veterans in our eye care population complained of severe ocular surface symptoms and that symptoms negatively correlated with physical functioning and mental health. Furthermore, only 50% of patients with severe symptoms had their symptoms or a treatment plan documented in their medical record. This is an important finding that is relevant to all eye care professionals and suggests that providers should be more vigilant in eliciting ocular surface complaints, as correctly identifying and treating patients with severe symptoms may improve their functionality.

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Biosketch

Bozorgmehr Pouyeh, MD, is a pre-residency research fellow at Bascom Palmer Eye Institute (BPEI) and Miami Veteran Affair Medical Center (VAMC). He completed his medical education in Iran at Tehran University of Medical Sciences. He has collaborated with faculty of BPEI and Miami VAMC on various projects on dry eye, DSAEK, and fungal keratitis and introduced innovative ways of automating data collection. He envisions to expand his work by implementing solutions for the diagnosis of challenging ophthalmic conditions such as fungal keratitis.

Biosketch

Anat Galor, MD, is an Assistant Professor of Clinical Ophthalmology at the Bascom Palmer Eye Institute and a staff physician at the Miami VAMC. She completed an ophthalmology residency at the Cleveland Clinic Cole Eye Institute, followed by a uveitis fellowship at Wilmer Eye Institute and a cornea fellowship at Bascom Palmer Eye Institute. Dr Galor's research interests focus on understanding the pathophysiology and improving treatment outcomes of ocular surface conditions including dry eye syndrome, ptergyium, and conjunctival intraepithelial neoplasia.

Dry Eye Questionnaire 5 (DEQ5)

1. Questions about **EYE DISCOMFORT** (please circle responses below)

a. During a typical day in the past month, **how often** did your eyes feel discomfort?

Never	Rarely	Sometimes	Often	All the time
0	1	2	3	4

b. When your eyes felt discomfort, **how intense was this feeling of discomfort** at the end of the day, within two hours of going to bed?

Never have it	Not at all intense				Very Intense
0	1	2	3	4	5

2. Questions about **EYE DRYNESS**

a. During a typical day in the past month, **how often** did your eyes feel dry?

Never	Rarely	Sometimes	Often	All the time
0	1	2	3	4

b. When your eyes felt dry, **how intense was this feeling of dryness** at the end of the day, within two hours of going to bed?

Never have it	Not at all intense				Very Intense
0	1	2	3	4	5

3. Questions about **WATERY EYES**

During a typical day in the past month, **how often** did your eyes look or feel excessively watery?

Never	Rarely	Sometimes	Often	All the time
0	1	2	3	4

Score: 1a + 1b + 2a + 2b + 3 = Total

___ + ___ + ___ + ___ + ___ = ___ .

SUPPLEMENTAL FIGURE. The Dry Eye Questionnaire 5.