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Prevalence and Risk Factors of Dry Eye Syndrome in a United States Veterans Affairs Population

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Abstract

PURPOSE—To evaluate the prevalence of dry eye syndrome (DES) and its associated risk factors in a US Veterans Affairs population receiving ocular care services.

DESIGN—Retrospective study.

SETTINGS: Patients were seen in the Miami and Broward Veterans Affairs eye clinics between 2005 and 2010.

PATIENTS POPULATION: Patients were divided into cases and controls with regard to their dry eye status (cases = ICD9 code for DES plus dry eye therapy; controls = patients without ICD9 code plus no therapy).

MAIN OUTCOME MEASURES: The prevalence of DES and its associated risk factors.

RESULTS—A total of 16 862 patients were identified as either a dry eye case ($n = 2056$) or control ($n = 14\,806$). Overall, 12% of male and 22% of female patients had a diagnosis of DES, with female gender imparting a 2.40 increased risk (95% confidence interval [CI] 2.04–2.81) over male gender. Several medical conditions were found to increase DES risk including post-traumatic stress disorder (odds ratio [OR] 1.97, 95% CI 1.75–2.23), depression (OR 1.91, 95% CI 1.73–2.10), thyroid disease (OR 1.81, 95% CI 1.46–2.26), and sleep apnea (OR 2.20, 95% CI 1.97–2.46) (all analyses adjusted for gender and age). The use of several systemic medications, including anti-depressant medications (OR 1.97, 95% CI 1.79–2.17), anti-anxiety medication (OR 1.74, 95% CI 1.58–1.91), and anti-benign prostatic hyperplasia medications (OR 1.68, 95% CI 1.51–1.86), was likewise associated with an increased risk of DES.

CONCLUSIONS—The prevalence of DES was found to be high in both men and women in our eye care population. This is the first study to demonstrate that in a veteran population, several diagnoses were significantly associated with DES, including post-traumatic stress disorder and depression.

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DRY EYE SYNDROME (DES) HAS RECENTLY GAINED recognition as a public health problem.^{1–3} Part of this recognition came from several United States (US) and international population-based studies that identified the condition in 5% to 30% of the population aged 50 years or older.^{1,2,4–17} These estimates suggest that DES is more prevalent than diabetes (~8% of US population),¹⁸ cancer (~3% of US population),¹⁹ and heart disease (~7% of US population).²⁰ Another part of the recognition came from understanding that the symptoms of DES, which include constant irritation, foreign body sensation, and blurred vision, interfere with the ability to work and carry out daily functions.^{21–23} A study using the Impact of Dry Eye Living Questionnaire (IDEEL) found that severe dry eye symptoms were correlated with difficulties in physical, social, and mental functioning.²⁴ A case-control study assessing the impact of dry eye symptoms on everyday activities found that patients with DES had difficulties with reading, carrying out professional work, watching television, and driving.²² These studies illustrate how significantly dry eye symptoms can impact a patient's functioning.

Similar to worldwide experience, we believe that this condition presents a serious health problem within the Veterans Affairs population as many of the known risk factors associated with DES are common in veterans, namely older age, tobacco use, and use of systemic medications (eg, antidepressants, blood pressure medications). However, there is a paucity of data on DES in populations such as ours as prior DES research has focused predominantly on women and/or non-Hispanic whites.^{6,25} The Veterans Affairs administrative database provides a unique opportunity to study the epidemiology of DES as it has demographic, diagnosis, and medication information on a large number of patients. The goal of this study was to evaluate the prevalence of DES and its associated risk factors in a US veteran population and to compare these factors with those in the published literature.

METHODS

STUDY POPULATION

Patients seen in the Miami and Broward Veterans Affairs eye clinics between July 15, 2005 and July 15, 2010 were included in this analysis. Patients seen in Veterans Affairs clinics consist of ex-military personnel but do not include or represent all former military recruits. Patients seen in other Veterans Affairs outpatient clinics during this time period were not included as a preliminary analysis revealed that non-eye care professionals did not use the ICD9 code for DES. Patients were divided into cases and controls with regard to their dry eye status (cases included patients with an International Classification of Disease code [ICD9] for DES [375.15] who received some form of dry eye therapy [n = 2056]; controls included patients without an ICD9 code for DES who did not receive any form of dry eye therapy [n = 14 806]). Dry eye therapies included any type of artificial tear, gel, or ointment; topical cyclosporine 0.05% (Restasis); or punctal plugging procedure (Current Procedural Terminology code 68760 and 68761). Patients were excluded from the risk factor analysis if they had discordant dry eye information (eg, an ICD9 diagnosis but no dry eye therapy [n = 608] or no ICD9 diagnosis but with dry eye therapy [n = 3261]). The Miami Veterans Affairs Institutional Review Board reviewed and approved this study, which was conducted in accordance with the principles of the Declaration of Helsinki.

DATA COLLECTION

All data were extracted from the Veterans Affairs administrative database by an expert programmer (D.C.) and automatically converted into an Excel format. The data used for this analysis included demographic information (date of birth, gender, race, ethnicity), medical diagnosis information (extracted based on ICD9 codes), and use of systemic therapy (extracted based on pharmacy codes). The date at which DES was first diagnosed (if applicable) and the date of last visit were also extracted from the database.

MAIN OUTCOME MEASURES

The main outcome measure was prevalence of DES and its associated risk factors.

STATISTICAL ANALYSIS

All statistical analyses were performed using SPSS 18.0 (SPSS Inc, Chicago, Illinois, USA) statistical package. All *P* values are 2-sided and nominal. A crude period prevalence was calculated by dividing the number of dry eye cases identified over the 5-year period (ICD9 375.15 and dry eye therapy) over all patients seen during that time period. As it is likely that some patients with discordant ICD9 code/medication status information were misclassified dry eye cases, these patients were not included in the risk factor analyses. The exclusion of such discordant cases did have the effect of inflating the prevalence estimate in the risk factor analysis over the crude estimate. For the risk factor analysis, continuous variables were compared between the groups using the Student *t* test and categorical variables were compared using the χ^2 test. Multivariate logistic regression analyses (using the presence of DES as the dependent variable) were used to evaluate the effect of various risk factors on DES. All multivariate analyses were adjusted for gender and age.

RESULTS

DES PREVALENCE

The *crude period prevalence* (number of dry eye cases over 5-year period divided by all patients seen during that time period) of dry eye syndrome in our veteran population was 10% ($n = 2056/20\,731$).

RISK FACTOR ANALYSIS OF DEMOGRAPHIC CHARACTERISTICS

Excluding discordant cases ($n = 3869$), a total of 16 862 patients were identified as being either a dry eye case ($n = 2056$) or control ($n = 14\,806$). The *period prevalence* for these patients (number of dry eye cases over 5-year period divided by a denominator, which excluded patients with discordant information) was 12% ($n = 2056/16\,862$). Demographic characteristics of these patients are summarized in Table 1. Overall, 12% of male subjects and 22% of female subjects had a diagnosis of DES, with female gender imparting a 2.40 increased risk of DES (95% confidence interval [CI] 2.04–2.81) over male gender, $P < .0001$. The Figure depicts the percentage of patients with DES by decade of age and gender; female patients had a higher percentage of DES in each age group compared to male patients and the overall risk of DES increased by 1.06 for each increasing decade (95% CI 1.02–1.10). The Veterans Affairs administrative database did not have complete information on

race and ethnicity (information on race and ethnicity was available for approximately 30% of patients). With this limitation, black patients had a slightly increased prevalence over white patients (20% vs 18%, odds ratio [OR] 1.42, 95% CI 1.21–1.66) and Hispanic ethnicity had a slightly increased prevalence over non-Hispanic ethnicity. A sensitivity analysis was performed to determine if the exclusion of patients with discordant ICD9 and treatment information affected these demographic findings. Four such analyses were performed by including each excluded group (positive ICD9 but no therapy and absent ICD9 but with therapy) into both the DES and the no-DES categories. Results of the analyses revealed small changes in the magnitude of risk but no significant changes in its direction (Table 2).

RISK FACTOR ANALYSIS OF MEDICAL CONDITIONS

Systemic diagnoses were identified in the administrative database using ICD9 codes. After adjusting for gender and age, several medical conditions were found to increase DES risk in our population (Table 3). The magnitude of the increased risk was high in patients with psychiatric diagnoses. Nineteen percent of patients with a diagnosis of post-traumatic stress disorder (PTSD) carried a concomitant diagnosis of DES as opposed to 11% of patients without this diagnosis (OR 1.97, 95% CI 1.75–2.23). Likewise, 17% of patients with a diagnosis of depression had DES as opposed to 10% without this diagnosis (OR 1.91, 95% CI 1.73–2.10). Other factors associated with a similar increased risk of DES included autoimmune conditions (OR 1.96, 95% CI 1.74–2.20), non-autoimmune arthritis (OR 2.23, 95% CI 2.02–2.45), thyroid diseases (OR 1.81, 95% CI 1.46–2.26), and sleep apnea (OR 2.20, 95% CI 1.97–2.46). In a forward stepwise regression model considering age, gender, and all medical diagnosis, the presence of a psychiatric diagnosis (OR 1.54) and PTSD (OR 1.34) remained significant predictors of DES risk.

RISK FACTOR ANALYSIS OF SYSTEMIC MEDICATIONS

The use of several systemic medications was likewise associated with an increased risk of DES (Table 4). The highest increased risk was found in patients using antihistamines, with a 22% prevalence of DES in users compared to a 10% prevalence in non-users (OR 2.53, 95% CI 2.28–.80). Other medications associated with an increased DES risk were antidepressant medications (OR 1.97, 95% CI 1.79–2.17), anti-anxiety medication (OR 1.74, 95% CI 1.58–1.91), and anti-benign prostatic hyperplasia (BPH) medications (OR 1.68, 95% CI 1.51–1.86). A multivariate logistic regression examining the relationship between medical diagnoses and use of relevant systemic medications revealed that for psychiatric diagnosis and BPH, both the use of the medications and the diagnosis remained significant risk factors, although the magnitude of each association decreased when both factors were analyzed concomitantly. For psychiatric diagnosis, the odds ratio of depression decreased from 1.91 to 1.31 (95% CI 1.14–1.50, $P < .0001$) and the odds ratio of PTSD decreased from 1.97 to 1.40 (95% CI 1.22–1.60, $P < .0001$). The odds ratio of BPH decreased from 1.62 to 1.30 (95% CI 1.14–1.48, $P < .0001$).

DISCUSSION

THE GOAL OF THIS STUDY WAS TO USE THE VETERANS

Affairs administrative database to estimate the prevalence of DES in a veteran population and to examine which medical diagnosis and systemic medications were associated with an increased risk of DES. Several previous studies have similarly reported on DES prevalence and risk factors and we wished to compare our findings with those of other US and international populations. As the scope of DES in the Veterans Affairs population has not previously been evaluated, there is a knowledge gap with regard to DES's impact on veteran health. Given that the veteran population is not identical to the US population with regard to demographics, exposures, and medical conditions, we felt that it was essential to study DES specifically within this population. The Miami and Broward Veterans Affairs clinics provide the opportunity to study the epidemiology of DES in a unique population that is predominantly male with diverse cultural and racial origins.

We found that a significant proportion of patients in our retrospective study had DES, with men having an overall prevalence of 12%. In arriving at this prevalence estimate, we chose to include only patients seen in the eye care clinic as it was discovered that non-eye care professionals did not use the ICD9 code 375.15. Given our reliance on ICD9 coding to define DES patients, we felt that including patients seen in other Veterans Affairs out-patient clinics would have significantly underestimated the DES prevalence. Therefore, it is important to note that our prevalence estimates are generalizable only to veteran populations receiving ocular care services. Furthermore, as we could not determine the exact timing of DES onset from the Veterans Affairs electronic medical record, we calculated a period prevalence that combined existing DES cases with incident cases during the 5-year study period. Our calculated period prevalence may therefore be an overestimation of the true point prevalence at any given time point.

While comparisons with the literature are difficult given the different methodologies used, our prevalence estimate is higher than that found in Schaumberg and associates' prospective study of men from the Physicians Health Study.²⁶ In this study, DES prevalence ranged from 3.9% in those aged 50 to 54 years to 7.7% in those aged 80 years and older. We believe that the prevalence rate in veteran men would be even higher if DES was assessed in a prospective manner. Regarding demographic factors affecting DES risk, our study showed similar findings to previous ones with an association between DES, female gender, and older age.^{1,9,10,15,16,27-32}

We also examined the relationship between several systemic diagnoses and DES. We found that several previously described risk factors were associated with DES in our population, including arthritis,^{6,9,10} thyroid disease,⁶ and BPH.²⁶ The magnitude of these factors was also similar, with arthritis portending a 2.23 elevated risk of DES in our study as compared to a risk of 1.8 to 3.27 in other studies;^{6,9,10} similarly, thyroid disease portended a 1.81 increased risk in our study as compared to a reported risk of 1.41.⁶ In our population, we also found that the presence of psychiatric diagnoses including depression and PTSD increased the risk of DES by approximately 2-fold. This association remained when systemic medications used to treat the conditions were included in the analysis. This is the

first study to demonstrate an association between DES and PTSD, and given that veterans are disproportionally affected by the disorder compared to other populations, this is an important factor to evaluate when considering the scope of DES in the Veterans Affairs population.

Our study also supported the association between several medications and DES, including the use of anti-anxiety and antidepressant medications,^{10,29} diuretics,^{28,33} antihistamines,^{28,29} and anti-BPH medications.²⁶ After antihistamine use, the use of antipsychiatric medications were associated with the highest increased risk of DES (approximately a 2-fold increased risk). This magnitude of increased risk is supported by other studies, which found a 1.7 to 1.9 increased risk of DES in patients using antidepressant medications.^{10,25} As the human conjunctival epithelium has been found to contain both muscarinic and adrenergic receptors,³⁴ there is biologic plausibility that antidepressant, anti-anxiety, and anti-BPH medications may have an effect on the ocular surface.

As with all retrospective reports, our study has limitations that need to be considered when interpreting the study results. This study relied on ICD9 codes and medication use to define and exclude DES. In this manner, it is possible that patients with DES but without a documented diagnosis were excluded from the case group or included in the control group. Given the retrospective nature of the study, the eye examination that led to the diagnosis of DES was also variable and it was therefore not possible to further subcategorize patients into mild and severe disease. Our study cases, therefore, include a heterogeneous mix of diagnoses, which could have influenced the strength and direction of associations in our analysis. Future studies with more precise case definitions should consider undertaking separate analyses depending on the underlying etiology of DES. In our analysis, we considered age at DES diagnosis to be the age at which the ICD9 code 375.15 was first documented. This is likely inaccurate as patients may have had DES for a variable time period prior to the diagnosis being recorded. Furthermore, it is well known that environmental factors play a role in DES. As information on many factors was not available in the administrative database (eg, tobacco use, computer use, environmental conditions), we were unable to evaluate the role of these features in the epidemiology of DES in this population.

With these limitations in mind, this study is the first to specifically study DES prevalence and risk factors in a veteran population. We found that a large proportion of both men and women in our population had a diagnosis of DES. The presence of DES increased with age and was more likely in those with a psychiatric diagnosis and in those using psychiatric medications, among other variables. This suggests that veterans may be uniquely more susceptible to DES than the general population, given the comorbidities found in this population of patients.

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Biographies

Anat Galor, MD, is an Assistant Professor at the Bascom Palmer Eye Institute, Miami, Florida, 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, pterygium, and conjunctival intraepithelial neoplasia.

Victor L. Perez, MD, performed his residency training at the Massachusetts Eye & Ear Infirmary (MEEI) in Boston, Massachusetts. He then completed a Cornea and External Diseases and Uveitis Fellowship at MEEI and a Research Fellowship for Ocular Immunology at Schepens Eye Research Institute. Dr Perez is currently the director of the Ocular Surface and Inflammation Research Program at Bascom Palmer Eye Institute. His clinical practice is dedicated to cornea and stem cell transplantation, medical and surgical care of patients with autoimmune disorders of the anterior segment and keratoprosthesis.

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FIGURE.
Percentage of patients with dry eye syndrome in a Veterans Affairs population by gender and age.

TABLE 1

Baseline Demographic Information in Patients Seen at the Miami and Broward Veterans Affairs Medical Center Eye Clinics in the Past 5 Years

Patient Characteristic	Number ^a	Prevalence	Odds Ratio ^b	P Value
Gender				
Male	1831	12%	1.00	<.0001
Female	225	22%	2.40 (2.04–2.81)	
Race				
White	596	18%	1.00	<.0001
Black	341	20%	1.42 (1.21–1.66)	
Other	1	4%	N/A ^c	
Ethnicity				
Hispanic	139	21%	1.00	.032
Not Hispanic	799	18%	0.80 (0.65–0.98)	

^aNumber of patients with dry eye syndrome (present if ICD9 code 375.15 and received no form of dry eye therapy). if no ICD9 code 375.15 and received no form of dry eye therapy).

^bOdds ratio adjusted for gender and age. A risk ratio greater than 1 represents an increased likelihood of dry eye disease.

^cNot calculated due to small number of patients in group.

TABLE 2

Sensitivity Analysis to Determine if Exclusion of Patients With Discordant ICD9 and Treatment Information Affected Demographic Findings

Inclusion of Patients With Discordant ICD9/ Medication Status	Patient Characteristic	Number ^a	Prevalence	Odds Ratio ^b	P Value
ICD9 yes ; therapy no included in DES	Male	2358	14%	1.00	<.0001
group (total N = 17 470)	Female	306	28%	2.50 (2.17–2.89)	
ICD9 yes ; therapy no included in no-DES	Male	1831	11%	1.00	<.0001
group (total N = 17 470)	Female	225	20%	2.25 (1.92–2.64)	
ICD9 no ; therapy yes included in DES	Male	4882	26%	1.00	<.0001
group (total N = 20 123)	Female	435	35%	1.71 (1.51–1.94)	
ICD9 no ; therapy yes included in no-DES	Male	1831	10%	1.00	<.0001
group (total N = 20 123)	Female	225	18%	2.27 (1.94–2.65)	

DES = dry eye syndrome.

^aNumber of patients with DES.

^bA risk ratio greater than 1 represents an increased likelihood of dry eye disease.

TABLE 3

Medical Conditions as Defined by ICD9 Code in Patients Seen at the Miami and Broward Veterans Affairs Medical Center Eye Clinics in the Past 5 Years

Medical Condition (ICD9 Codes Used)	Number	Prevalence	Odds Ratio ^a	P Value
Vascular				
Diabetes mellitus (250)				
Yes	692	10%	0.68 (0.62–0.75)	<.0001
No	1364	14%	1.00	
Hypertension (401–405)				
Yes	1520	13%	1.35 (1.21–1.51)	<.0001
No	536	10%	1.00	
Lipid metabolism disorder (272)				
Yes	1458	13%	1.28 (1.16–1.42)	<.0001
No	598	10%	1.00	<.0001
Ischemic heart disease (410–414)				
Yes	605	13%	1.09 (0.98–1.21)	.13
No	1451	12%	1.00	
Cerebral vascular disease (430–438)				
Yes	341	16%	1.37 (1.21–1.56)	<.0001
No	1715	12%	1.00	
Psychiatric				
Psychiatric illness (291–2, 294–301)				
Yes	1021	17%	2.08 (1.90–2.29)	<.0001
No	1035	9%	1.00	
Post-traumatic stress disorder (309.81)				
Yes	414	19%	1.97 (1.75–2.23)	<.0001
No	1642	11%	1.00	
Depression (300.4, 296)				
Yes	873	17%	1.91 (1.73–2.10)	<.0001
No	1183	10%	1.00	
Alcohol dependence (291, 303)				
Yes	209	15%	1.49 (1.27–1.74)	<.0001
No	1847	12%	1.00	
Drug dependence (292, 304, 305)				
Yes	651	13%	1.28 (1.15–1.41)	<.0001
No	1405	12%	1.00	
Autoimmune & arthritis				
Autoimmune diseases ^b				
Yes	428	20%	1.96 (1.74–2.20)	<.0001
No	1628	11%	1.00	
Non-autoimmune arthritis (715, 716)				
Yes	939	19%	2.23 (2.02–2.45)	<.0001

Medical Condition (ICD9 Codes Used)	Number	Prevalence	Odds Ratio ^a	P Value
No	1117	9%	1.00	
Gout (274)				
Yes	153	15%	1.37 (1.14–1.64)	.001
No	1903	12%	1.00	
Thyroid diseases (241, 242, 245, 246)				
Yes	109	21%	1.81 (1.46–2.26)	<.0001
No	1947	12%	1.00	
Prostate				
Benign prostatic hyperplasia (600)				
Yes	646	16%	1.62 (1.46–1.81)	<.0001
No	1410	11%	1.00	
Prostate cancer (185)				
Yes	186	14%	1.13 (0.96–1.33)	.16
No	1870	12%	1.00	
Miscellaneous				
Sleep apnea (327.2, 780.51, 780.53)				
Yes	524	20%	2.20 (1.97–2.46)	<.0001
No	1532	11%	1.00	
Rosacea (695.3)				
Yes	72	21%	1.85 (1.42–2.41)	<.0001
No	1984	12%	1.00	
Human immunodeficiency virus (V08, 042)				
Yes	63	16%	1.52 (1.15–2.00)	.003
No	1993	12%	1.00	
Ocular				
Glaucoma (365)				
Yes	587	14%	1.22 (1.10–1.36)	<.0001
No	1469	12%	1.00	

HIV = Human immunodeficiency virus.

^aOdds ratio adjusted for gender and age. A risk ratio greater than 1 represents an increased likelihood of dry eye disease.

^bAutoimmune diseases include: Behcet syndrome, autoimmune disease, sarcoid, systemic lupus erythromatosis, rheumatoid arthritis, Wegner granulomatosis, vasculitis, vitiligo, psoriasis, ankylosing spondylitis, inflammatory bowel disease, Reiter syndrome, autoimmune hepatitis, collagen vascular diseases (136.1, 279.4, 135, 710.0–5, 695, 714, 446.4, 447.6, 446, 709.01, 696, 720, 555, 556, 558, 099.3, 711.1, 571.42, 710.9).

TABLE 4

Systemic Medications in Patients Seen at the Miami and Broward Veterans Affairs Medical Center Eye Clinics in the Past 5 Years

Systemic Medications ^a (Pharmacy Code)	Number	Prevalence	Odds Ratio ^b	P Value
Antihistamines (AH109)				
Yes	668	22%	2.53 (2.28–2.80)	<.0001
No	1388	10%	1.00	
Anti-anxiety medication (CN302)				
Yes	778	17%	1.74 (1.58–1.91)	<.0001
No	1278	11%	1.00	
Antidepressant medication (CN609)				
Yes	929	17%	1.97 (1.79–2.17)	<.0001
No	1127	10%	1.00	
Beta blockers (CV100)				
Yes	869	13%	1.11 (1.00–1.22)	.04
No	1187	12%	1.00	
Anti-BPH medications (CV150)				
Yes	732	16%	1.68 (1.51–1.86)	<.0001
No	1324	11%	1.00	
Calcium channel blockers (CV200)				
Yes	796	14%	1.31 (1.19–1.44)	<.0001
No	1260	11%	1.00	
Cholesterol-lowering medication (CV350)				
Yes	1318	13%	1.11 (1.00–1.22)	.05
No	738	12%	1.00	
Loop diuretic (CV702)				
Yes	385	15%	1.23 (1.09–1.39)	<.0001
No	1671	12%	1.00	
ACE inhibitor (CV 800)				
Yes	1007	12%	1.00 (0.91–1.10)	.97
No	1049	12%	1.00	
Angiotensin receptor antagonist (CV805)				
Yes	239	15%	1.23 (1.06–1.43)	.005
No	1817	12%	1.00	

^a Antihistamines = astemizole, loratadine; Anti-anxiety = alprazolam, chlordiazepoxide, clorazepate, diazepam, flurazepam, lorazepam, midazolam, oxazepam, prazepam, Serax, temazepam, triazolam, valium, xanax; Antidepressant = bupropion, citalopram, duloxetine, escitalopram, fluoxetine, fluvoxamine, maprotiline, milnacipran, mirtazapine, nefazodone, paroxetine, trazodone, sertraline, venlafaxine; Beta blockers (not including topical medications) = acebutolol, atenolol, betapace, metoprolol, bisoprolol, carvedilol, Corgard, esmolol, labetalol, metoprolol, nadolol, penbutolol, pindolol, propranolol, sotalol, timolol; Anti-benign prostatic hyperplasia (BPH) medications = alfuzosin, doxazosin, prazosin, tamsulosin, terazosin; Calcium channel blockers = amlodipine, bepridil, Calan, diltiazem, felodipine, isradipine, nifedipine, nimodipine, verapamil; Cholesterol lowering medication = atorvastatin, cerivastatin, cholestyramine, clofibrate, colessevelam, colestipol, ezetimibe, ezetimibe/simvastatin, fenofibrate, fluvastatin, gemfibrozil, lipid, lovastatin, omega-3 acid, pravastatin, probucol, rosuvastatin, simvastatin; Loop diuretic = bumetanide, ethacrynic acid, furosemide, torsemide; Angiotensin converting enzyme (ACE) inhibitor = benazepril, captopril, enalapril, enalaprilat, fosinopril, lisinopril, quinapril, ramipril, Vasotec; Angiotensin receptor antagonist = candesartan, irbesartan, losartan, olmesartan, valsartan.

^b Odds ratio adjusted for gender and age. An odds ratio greater than 1 represents an increased likelihood of dry eye disease.