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Dry eye disease in an adult population in South-West Nigeria

Segun I. Olaniyan[a], Oluyemi Fasina[b,*], Charles O. Bekibele[b], Ayobade O. Ogundipe[a]

[a] Department of Ophthalmology, University College Hospital, Ibadan, Nigeria
[b] Department of Ophthalmology, University College Hospital/University of Ibadan, Ibadan, Nigeria

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ABSTRACT

Aim: To determine the prevalence and factors associated with dry eye disease (DED) in an adult population in south-west Nigeria.
Method: A descriptive cross-sectional community-based study was conducted among respondents aged 40 years and above. Questionnaires were administered on symptoms of DED, followed by ocular examination to elicit signs of DED by determining the tear film break-up time, corneal fluorescein staining score, and Schirmer I tests. Dry eye was diagnosed by the simultaneous presence of at least one symptom experienced "*often or all of the time*" and at least one sign in either eye.
Result: The respondents (n = 363; females 188) were aged 59.1 ± 13.1 years. The prevalence of DED was 32.5% (95% CI = 27.7–37.3), and the most commonly reported symptoms were grittiness (53.4%, 95% CI = 44.4-62.4) and burning/stinging sensation (48.3%, 95% CI = 39.3–57.3). On multivariate analysis, DED was significantly associated with age (OR 2.89, 95% C.I = 1.67–4.93, $p < 0.001$) but not use of benzalkonium containing topical medications, previous ocular surgery, household fuel use, menopausal status and presence of pterygium.
Conclusion: The outcome of the study shows that the prevalence of DED among adults above 40 years in south-west Nigeria is 32.5% and the associated risks include older age.

1. Introduction

Dry eye disease (DED) is a multifactorial disease of the tears and ocular surface that results in symptoms of discomfort, visual disturbance, and tear film instability with potential damage to the ocular surface. It is usually accompanied by increased osmolarity of the tear film and inflammation of the ocular surface [1]. Several population-based studies [2–5] have reported the prevalence of DED ranging from 5% [5] to 35% [4]. This wide disparity in prevalence has been attributed to racial differences in the epidemiology of DED and lack of standardized diagnostic definition [1].

The reported risk factors for DED include female sex, older age, postmenopausal estrogen therapy [6], low omega 3 essential fatty acids diets or diets with high ratio of omega 6 to omega 3 fatty acids; [7] refractive surgery, vitamin A deficiency, radiation therapy, bone marrow transplantation, hepatitis C infection, and certain classes of systemic and ocular medications, including anxiolytics, tricyclic antidepressants, anti-histamines [2–8]. Reports on the associations between DED and some factors, like alcohol intake, cigarette smoking, caffeine, acne, and menopausal status are conflicting [9]. However, decreased blink rate and environmental factors like low humidity, aircraft cabins, high room temperature and air velocity, or indoor air pollution have been associated with DED

With increasing life expectancy, the number of people aged 60 years and older is expected to increase with consequent increase in the prevalence of DED in the population [3–5]. Cataract surgery [10], use of benzalkonium containing topical medications [11] and pterygium [12,13] are also risk factors for tear film abnormalities and subsequent DED in south west Nigeria. The economic loss from DED results from cost of healthcare utilization, prescription medications, surgical interventions, and over-the-counter medications while indirect costs include lost work time and productivity, alteration in the work type or environment and decreased work time [14].

There is paucity of data on DED in Nigeria; thus, this study aimed to determine the prevalence, pattern of presentation and associations of DED in an adult population in South-west Nigeria. To the best of the investigators' knowledge, this is the first community-based study on DED in this environment.

* Corresponding author.
E-mail address: yemifash2000@yahoo.com (O. Fasina).

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2. Methods

A descriptive cross-sectional study was carried out in Iseyin Local Government Area (LGA) between March and April 2014 during the dry season. It is one of the 33 LGAs in Oyo State, south-west Nigeria and comprises eleven wards with an estimated population of 255,619 [15]. The inhabitants work mostly outdoors as traders, farmers and weavers. Oyo state has an equatorial climate with dry and wet seasons and relatively high humidity. The dry season lasts from November to March while the wet season starts from April and ends in October. The study population comprised adults aged 40 years and above randomly selected from five of the 11 wards of the LGA through a multi-staged sampling procedure. Each ward comprises 14 settlements and three settlements were randomly selected from each of the five wards using a table of random numbers. Proportional allocation of respondents for each of the settlements was done by dividing the estimated number of households of each settlement (about 90 households), by the estimated sample size of the settlements. In each selected household, only one eligible respondent was recruited for the study. A simple ballot was used to decide the respondent to be included in the study where there were more than one eligible respondent. The sample size was calculated using the Leslie-Keish formula [16] for single proportion. Using a prevalence of 11% from a previous study [17] and adjusting for a non-response rate of 15.4%, a sample size of 363 was calculated.

Included in the study were individuals aged 40 years and above, who had been resident in the community for a minimum of three months while those excluded were respondents having ocular conditions such as infective conjunctivitis, those who had undergone any extraocular or intraocular surgery or manipulation three months prior to the study, respondents with lagophthalmos or other lid abnormalities that could result in exposure keratopathy. Respondents' socio-demographic data, history of ocular and systemic diseases, use of benzalkonium containing topical medication, smoking habits and type of household fuel use were recorded. A part of the Salisbury Eye Evaluation Questionnaire [2] (a validated 6- item questionnaire relating to dry eye symptoms and evaluating the frequency of symptoms) was administered to all respondents Responses of '*often*' or '*all of the time*' for one or more symptoms was considered as positive for dry eye. Slit lamp (Huvitz HS-5000) biomicroscopy of the anterior segment were carried out to rule out conditions that could predispose to DED.

Objective tests carried out include tear break up time (TBUT) and corneal fluorescein staining followed by Schirmer I test with local anesthetic. TBUT was done by applying a fluorescein strip (Omni lens Pvt. Ltd, India) wetted with sterile water into the conjunctival sac of each eye. The subjects were asked to blink. The time interval between the last complete blink and the appearance of a random dark spot on the cornea under the blue filter of the slit lamp was measured with a stopwatch (CASIO G 9700), and the mean of three measurements was noted. A value of 10 s or less was taken as positive for dry eye [18]. Fluorescein staining of the cornea was observed through the slit lamp biomicroscope with a cobalt blue filter and was graded as '0' for 'no staining'; as '1' for 'mild staining with a few disseminated stains, limited to less than one-third of the cornea; as "2" for 'moderate staining with a severity between grades 1 and 3'; or as '3' for 'severe staining with confluent stains occupying half or more of the cornea' [18]. A score of ≥ 1 was taken as positive for dry eye. Lastly, Schirmer I test with local anesthetic was done 30 min after the Fluorescein test to prevent ocular irritation by the test strip and interference with the previous tests. Subjects were seated in a darkened room with fans switched off. Local anesthetic (Tetracaine hydrochloride 0.5%, Alcon—Courvreur, Belgium) was instilled into both eyes and excess gently wiped off with cotton wool. After 2 min, a pre-calibrated Schirmer strip (Whatmann filter paper no. 41, Omni lens Pvt. Ltd, India) was applied to the inferior conjunctival sac at the junction of the lateral third and medial two thirds. Subjects were asked to look straight ahead and allowed to blink normally. After 5 min, the test strips were removed and the amount of wetting was read off the graduated scale and recorded. Values less than or equal to 5 millimetres (mm) was taken as positive for DED [18].

2.1. Definitions diagnostic criteria

Dry eye was diagnosed by the simultaneous presence of at least one of six symptoms experienced "*often* or *all of the time*" and one of three positive signs; Schirmer test value of ≤ 5 mm or TBUT ≤ 10 s (indicative of qualitative or quantitative disturbance of the tear film) or corneal fluorescein staining score ≥ 1 point (presence of corneal epithelial damage). Subjects with only one criterion or none were classified as normal irrespective of symptoms. For each study participant, both eyes were tested, and the eye with the worse features was included in further analysis [17].

Ethical approval and clearance was obtained from the Ethical Committee of the University College Hospital Ibadan, and the Local Government Council. Written informed consent was obtained from the respondents, and the study followed the tenets of the Helsinki declaration

2.2. Data management and analysis

Data collected was analyzed using the Statistical Package for Social Sciences (SPSS) software (SPSS for Windows, version 21.0; SPSS, Inc, Chicago, Illinois). Summary statistics were presented using frequency tables, charts, means and rates. Chi-square and Fishers exact tests were used for categorical variables and Student's *T*-test for continuous variables. Multivariate logistic regression analysis was done to determine the relationship of dry eye with different variables. Level of statistical significance was set at 5%.

3. Results

Three hundred and sixty-three individuals were studied of which 188 (51.8%) were females, with a male: female ratio of 1:1.1. The mean age of the participants was 59.1 ± 13.1 years (males 60.4 ± 13.1 years and females 57.8 ± 13.0 years, $p = 0.06$) with a

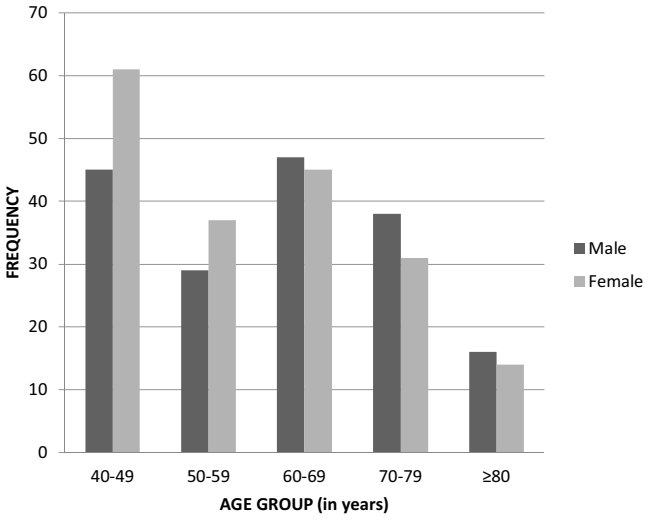

Fig. 1. Age and gender distribution of participants.