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Prevalence of Dry Eye Disease in a Rural Niger Delta Community, Southern Nigeria

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Abstract

Background: Dry Eye Disease (DED) or Dry Eye Syndrome (DES) is the fast growing public health problem characterized by deficiency in the quantity and/or quality of tear film due to tear deficiency or excessive tear evaporation. It negatively affects the health and the quality of life of individuals. Although dry eye is a common eye disease world-wide, many people are undiagnosed and untreated especially in underdeveloped countries. **Aim**: To determine the prevalence of dry eye disease in Aluu community. **Methods:** The cross-sectional, population-based study from 16th to 18th June 2016. Participants were members and residents of the community who consented to ocular examinations. Ocular examinations including Schimer's test were carried out. Data were entered into a spread sheet using statistical package for social sciences (SPSS) 16.0 statistical software and subsequently analysed. **Results**: Seven hundred and thirty persons (210 males and 520 females) participated in the study. The mean age was 34.2 ± 12.4 years. The prevalence of Dry Eye Disease in this study was 27.4%. Over 72% of the study population had normal Schimer's test 95% CI [15.0 - 15.2], 18.4% had mild dry eye syndrome 95% CI [10.1 - 10.7], 6.8% had moderate dry eye syndrome test 95% CI [5.5 - 7.6] while 2.2% had severe dry eye syndrome test 95% CI [3.0 - 3.8]. **Conclusion**: The prevalence of dry eye disease in Aluu community is high. It is therefore, advocated special eye healthcare intervention by governments and non-governmental agencies be extended to this rural Niger Delta community.

Keywords

Dry Eye Disease, Prevalence, Rural Niger Delta Community

1. Introduction

Dry Eye Disease is an established chronic ocular surface disease and a growing public health problem seen by eye care practitioners [1]. According to the Inter-

national Dry Eye Workshop 2007 (DEWS), dry eye is defined as a multifactorial disease affecting tear and the ocular surface with resultant ocular discomfort, blurring of vision, accompanied by increased tear osmolarity and ocular surface inflammation [2].

Dry Eye Disease (DED) is characterized by deficiency in the quantity and/or quality of tear film due to tear deficiency or excessive tear evaporation which causes damage to the ocular surface and is associated with symptoms of discomfort, ocular irritation, dryness and fluctuating visual disturbances, burning sensation, foreign body sensation, grittiness, itching of the eyes, and stinging feeling, pain, soreness, blurry vision, strain and photophobia [3]. These symptoms often have the negative impact on physical, social and psychological health as well as overall sense of well-being of the individual [4]. Wider consequences to dry eye disease are also evident, with reports of anxiety and depression associated with the condition and low Quality of life (QoL) [5].

Although the aetiology of Dry Eye Disease (DED) is still largely unknown, some of the risk factors have been identified. Dry eye diseases can be secondary to environmental, hormonal, physiological, contact lens wear and pathological causes [6]. With pathological causes, both the tear deficiency type and evaporative type can lead to the dry eye syndrome. Systemic diseases such as diabetes, thyroid disease, rheumatoid arthritis, systemic lupus etc. can also lead to dry eyes [6]. In addition, patients with previous eye surgeries or regular use of eye medications or systemic medications can be predisposed to dry eyes. Many systemic medications, such as antihistamines, antidepressants, beta-blockers and oral contraceptives can also be associated with dry eyes [6].

The diagnosis of dry eye is not straightforward due to its multifactorial nature of aetiology [7]. Many clinical tests such as tear break-up time, corneal staining, meibomian gland digital expression, tear osmolarity, Schirmer test and assessment of the symptoms using ocular surface disease index (OSDI) have been employed by various authors. However, there is so far no consensus on a gold standard diagnostic criterion. In many cases, symptoms and signs do not correlate well with each other. Ohashi reported that, symptoms of dry eye disease, Schirmer tests (<5 mm after 5 mins) and clearance test (<8×), fluorescein stain and Rose Bengal staining (>3+) qualify as clinical diagnosis of dry eyes [6].

In this study, the Schimer 1 test was used leveraging on its applicability in an epidemiological survey, speed of use, low cost and convenience. Although dry eye is a common eye disease world-wide, many people with dry eyes however, remain undiagnosed and untreated especially in underdeveloped countries [8]. In US, as many as 6% of the population over the age of 40 and more than 15% of the population over the age of 65 suffer from dry eye [1] [2]. According to a survey locally conducted, there is nearly 20% of the population with some dry eye symptoms [4]. The paucity of data on the epidemiology of DED in Niger Delta, Nigeria has necessitated this study in Aluu community.

2. Materials and Methods

This was a cross-sectional, population-based study to determine the prevalence

of Dry Eye Disease in Aluu community during a free medical out-reach expedition organized by the Salvation Ministries Port Harcourt from 16th to 18th June 2016.

Aluu is a rural community in Ikwerre Local Government Area of Rivers State, Nigeria. The community has a projected population of 12,300 people (2006 projected population) [9]. It is located about 20 km from the state capital-Port Harcourt and about 15 km from the local government headquarters-Isiokpo. Aluu plays host to the University of Port Harcourt. It comprises of nine villages each headed by a chief. The community has a paramount rural-Nye-we-ali Aluu, a second class chief who oversees the affairs of the entire Aluu community. It has two Primary Health Centers, one of which is affiliated to the Community Medicine Department of University of Port Harcourt Teaching Hospital. Final year medical students as well as Public/Community Health Doctors routinely undergo various outreach programmes in the primary health center. The Primary Health Center provides health care services to the entire people of Aluu and its environs.

Ethical approval for the study was obtained from the Research and Ethics Committee of the University of Port Harcourt. One thousand residents of Aluu community that participated in the free medical out-reach expedition and verbally consented to ocular examinations were recruited in the study. Consent and permission to carry out this study among the population was also obtained from the family heads/chiefs. The subjects were told that participation was absolutely voluntary and that the survey will be free of charge.

Basic eye examinations included checking the eyelids for trichiasis, globe for phthisis, cornea for opacity or pterygium and lens for obvious opacity. Special eye examination with pen torch for cornea opacities, pupil for pupillary light reaction and lens for any visible opacities. Basal and reflex tear secretion was measured by using the Schirmer test [10] by using 5 mm by 35 mm Whatmans filter paper without prior instillation of topical anaesthetic drops (schemer method 1). The filter paper was folded 5 mm from one end and inserted midway between the outer and middle third of the lower lid. The participants were allowed to gently close their eyes for 5 minutes after which the paper was removed and the amount of wetting measured from the fold. The measurements were done with the subjects in sitting position.

A reading of less than 10 mm was diagnostic of dry eye and graded as follows: Nomal (>15 mm), Mild (9 - 14 mm) Moderate (4 - 8 mm) and Severe (<4 mm) [11].

Data Analysis

Data obtained was recorded on the data form for all participants and was cross checked by the principal investigator for correctness and completeness and any omission was corrected. Information from the data forms was entered into a spread sheet using statistical package for social sciences (SPSS) 16.0 for Windows statistical software and then used for statistical analysis. Frequency distri-

bution tables or summary statistics was generated for all variables; differences were examined using Chi-square test and Student's t-test of significance for discrete and continuous variables, respectively. 95% Confidence intervals were tabulated. The independent association of risk factors with dry eye was assessed by the multiple logistic regression analysis test. Odds ratio was used to study the strength of the association of risk factors and dry eye. An observation was considered statistically significant when p-value was less than 0.05.

3. Results

A total of 730 persons (210 males and 520 females) participated in the study. This gives a male to female ratio of 1:2.5.

The modal age group was 21 - 30 years [Table 1]. The mean age was 34.2 ± 12.4 and age range was 8 - 64. The difference in the gender distribution in this study was statistically significant (p = 0.000) [Table 1].

Over 72% of the study population had normal Schimer's test 95% CI [15.0 - 15.2], 18.4% had mild dry eye syndrome 95% CI [10.1 - 10.7], 6.8% had moderate dry eye syndrome test 95% CI [5.5 - 7.6] while 2.2% had severe dry eye syndrome test 95% CI [3.0 - 3.8] [Table 2].

The difference in the prevalence of DED among the various genders was statistically significant [Table 3].

The difference in the prevalence of DED among the various age groups was statistically significant [Table 4].

Table 1. Age-gender distribution of the study population.

Age Group (Years)	Gender		Total (%)
	Male (%)	Female (%)	
<20	40 (5.5)	60 (8.2)	100 (13.7)
21 - 30	10 (1.4)	190 (26.0)	200 (27.4)
31 - 40	50 (6.9)	140 (19.1)	190 (26.0)
41 - 50	70 (9.6)	90 (12.3)	160 (21.9)
51 - 60	30 (4.1)	40 (5.5)	70 (9.6)
61 and Above	10 (1.4)	(-)	10 (1.4)
Total	210 (28.9)	520 (71.1)	730 (100)
Pearson Chi Square = 110.919; p = 0.000; df = 5			

Table 2. Distribution of Dry Eye Disease (DED) among the study population.

DED	Frequency	Percentage	Mean SD	CI	p-value
Normal (>15 mm)	530	72.6	15.4 ± 0.36	15.0 to 15.2	0.000
Mild (9 - 14 mm)	134	18.4	10.6 ± 0.89	10.1 to 10.7	0.000
Moderate (4 - 8 mm)	50	6.8	5.7 ± 1.5	5.5 to 7.6	0.000
Severe (<4 mm)	16	2.2	3.3 ± 0.4	3.0 to 3.8	0.000
Total	730	100			

Table 3. Distribution of DED according to gender.

	Gender		Total
	Male	Female	
DED (Yes)	40	160	200
(No)	170	360	530
Total	210	520	730
Pearson Chi Square = 10.333; p = 0.001			

Table 4. Distribution of DED according to age group.

	Age Group (Years)						
	<20	21 - 30	31 - 40	41 - 50	51 - 60	61 & above	
DED Yes	10	40	60	50	30	10	200
No	90	160	130	110	40	0	530
	100	200	190	160	70	10	730
Pearson Chi Square = 58.493; p = 0.000; df = 5							

4. Discussion

The prevalence of Dry Eye Disease in this study was 27.4% [Table 2]. Prevalence of DED in different population based-studies had been reported with varying range of 5.7% to 57.5% [12]-[17] and 17.0% - 29.9% in hospital based-studies [18]. This variation may be due to the different geographical locations and different populations studied. More importantly, there has been lack of consistency in the diagnostic tests and definition criteria. Different authors have used different tests such as tear break-up time, corneal staining, meibomian gland digital expression, tear osmolarity, Schirmer test and assessment of the symptoms using ocular surface disease index (OSDI) [6].

According to 2007 report of the international dry eye workshop (DEWS) [1], no single diagnostic test performed in the field or in the clinic could reliably distinguish individuals with and without dry eye. Although a variety of diagnostic tests are commonly used in the clinic, there is no consensus on which combination of tests should be used to define DED, either in the clinic or for the purposes of a research protocol [2]. A major problem has been the reported lack of correlation between patients' irritative ocular symptoms and the results of selected clinical tests for dry eye [2]. Much of this discrepancy can be explained by the lack of repeatability of many of the clinical tests in common use [2]. Other possible reasons for a lack of correlation between clinical tests and irritative symptoms could be the natural inconsistency of the disease process, the "subjective" nature of symptoms, and differences in pain thresholds and cognitive responses to questions about the ocular symptoms [2].

In this study, the Schimer 1 test was utilized because of its easy applicability in an epidemiological survey, speed of use, low cost and convenience. Although the Schirmer I test does not discriminate basal from reflex tearing, thereby making it difficult to determine which parameters the test is actually measuring; it is still

useful in clinical practice.

In a cluster sampled, population-based cross-sectional prevalence study on dry eye disease in 5190 adult population aged 40 - 64 years in Iran, Hashemi documented that the prevalence of dry eye was 8.7% while an abnormal Schirmer score was 17.8% [15]. He also observed that the prevalence of dry eye syndrome was significantly higher in women and that the condition was not significantly associated with age [15]. This finding collaborates our observation in this study, where the female gender had a higher prevalence of DED. However, in our study age difference was a significant epidemiological factor [Table 1]. No significance in age may be because of the narrow age range among the participants in Hashemi's study.

In an institutional cross sectional study conducted among 96 participants of young and middle aged office workers in Japan, Uchino [19] observed that the prevalence of dry eye disease among computer users was 57%. Uchino used self-administered questionnaire as the instrument of study among his study participants. In a web-based screening for DED study carried out on 1689 computer users aged 20 years and above, 36.2% of participants reported 5 or more dry eye symptoms. The participants that had symptoms of dry eye were investigated with schirmer test and 32.2% of them had abnormal tear production [20].

The Beijing Eye Study [16] which was a population-based study on prevalence of dry eye among 4439 subjects with age range of 40 years and above showed that the prevalence of dry eye was 21%.

In 2003, in the United States of America, a population-based survey on prevalence of dry eye among mid-aged and above, 39,876 women participating in the Women's Health Study showed the prevalence of DED to be 5.7% among women less than 50 years old and 7.8% among women greater than 50 years [20].

In this study, female gender and increase in age are associated with dry eye disease [Table 3 and Table 4]. Maissa [21] documented that females tend to have a reduction in the aqueous layer of the tear film with increasing age compared to males and that female gender (particularly per- and post-menopausal ages) were risk factors for dry eyes disease [1]. This increase in dry eye is thought to be associated with a decrease in tear production caused by hormonal changes [6]. Uchino and Hashemi also documented that female gender was associated with increased risk of DED [9] [15].

5. Conclusion

The prevalence of dry eye disease in Aluu community is high. It is therefore, advocated special eye healthcare intervention by governments and non-governmental agencies be extended to this rural Niger Delta community.

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