A questionnaire-based survey of dry eye disease among Undergraduate students of the University of the West Indies Saint Augustine campus, Trinidad and Tobago.

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ABSTRACT

Background

Dry eye disease is one of the most common ocular disorders and it involves inadequate tear production, improper tear quality and excessive tear evaporation. Symptoms of dry eye include burning of the eyes, excessive watering of the eyes, itchy eyes and foreign body sensation.

Objective

To determine the prevalence of dry eye and its associated factors among UWI St. Augustine, Trinidad and Tobago undergraduate students.

Method

A structured online modified standard dry eye questionnaire was used. Participants were considered to have dry eye diseases (DED) if they experienced more than one symptom of dry eye, mild dry eyes, if they experienced 2 symptoms, moderate dry eye if they experience 3 symptoms and severe dry eye if they have more than 4 symptoms

Results

The prevalence of DED among the UWI undergraduate students was 57.9%. It was observed that 59.3% (153) of the females experienced dry eye symptoms, compared to 55.3% (78) of the males. It was also found that the most common cause of DED was prolonged use of electronic devices. The most common symptom of DED was itchy eyes, as 92.2% of participants experienced this. The most common form of management of DED was found to be eye drops. It was also found that 71.2% of the participants were not aware of DED.

Conclusion

The prevalence of DED among the UWI undergraduate students was found to be high which could be as a result of the ongoing Covid-19 pandemic.

CHAPTER ONE: INTRODUCTION

1.0 Introduction

In light of the recent and ongoing Covid-19 pandemic, people have been forced to adapt to a new way of living, especially students are forced to have classes online resulting in spending excessive time using electronic devices such as phones, tablets, laptops and computers. This excessive time spent using electronic devices, leads to the increased risk of ocular problems including dry eye disease. Dry eye disease could cause a lot of discomfort to the visual system if not detected early and well managed. This research was conducted to obtain quantitative data on the prevalence of dry eye syndrome/disease and its associated factors among undergraduate students of the University of the West Indies (UWI), St. Augustine campus, Trinidad and Tobago. This chapter explained the basic outline of the study including the aim, objectives, rationale, significance, and limitations.

1.1 Background of Study

Dry eye disease is a multifactorial, common condition where the eye is unable to be sufficiently lubricated by one's natural tear production.[1]Tears which are formally known as the tear film, consists of 3 layers which are produced and secreted onto the eye to provide it with adequate lubrication which is equally distributed across the eye upon blinking. The layers of the tear film helps to reduce the rate of tear evaporation, even lubrication of the eye and equal distribution of the tears across the surface of the cornea upon blinking.[2]

Dry eye comes in different forms, evaporative dry eye and aqueous deficient dry eye.[3] Evaporative dry eye results when an individual's meibomian glands, which are responsible for secreting oil to the tear film to reduce the rate at which the tears evaporate, become clogged leading to an increased

tear evaporation rate.[3] Aqueous deficient dry eye occurs when a person's lacrimal gland which is responsible for secreting the aqueous component of the tear film has a malfunction and as a result enough water is not produced.[3]

Some common causes of dry eyes include computer use, aging, menopause, ventilation, smoking, health conditions, medications, eyelid problems, contact lens use, vitamin A deficiency, eye allergies, preservatives in topical eye drops and posterior blepharitis to name a few.[4]

Burning, itching, sensitivity to light, red eyes, foreign body sensation, watery eyes, blurred vision, stringy mucus, faster eye fatigue than usual and eyelids stuck together when waking up are common symptoms associated with dry eyes.[4]

Complications which regularly accompany dry eyes patients are increased risk of eye infections due to the tears being the main line of defense against infections of the eyes, increased risk of corneal abrasion as the ocular surface is now so dry that it's easily abraded. Decrease in visual acuity also occurs as the tear film aids in the refraction of light onto the retina to obtain a clear image.[4]

Common treatment options for dry eyes include: warm and cold compresses, lid scrubs, eye drops, punctal plugs and omega 3 supplements, restasis. [5]

1.2 Problem statement:

Dry eye disease is a very common ocular disease in countries with hot weather conditions such as Trinidad and Tobago. Additionally, online classes have led to a prolonged computer and smartphone use due to the pandemic this can result in an increase in the prevalence of dry eye among students.[1] Several studies conducted in various countries have reported increases in the

prevalence of dry eye since the beginning of the Covid-19 pandemic and no study has been done in Trinidad and Tobago.[6] This study was therefore done to determine the prevalence of dry eye among undergraduate students of UWI St Augustine campus Trinidad and Tobago. Findings of which can be used to compare with findings from other places and needs for intervention.

1.3 Aim of the study:

The aim of this study was to determine the prevalence of dry eye and its associated factors among UWI undergraduate students.

1.4 Objectives:

To determine the demographic prevalence of dry eye disease.

To determine the causes of dry eye.

To determine the most common symptoms of dry eye.

To ascertain how many of the students are aware of the dry eye disease.

To document the various management methods people use on their dry eyes.

1.5 Research Questions:

What is the prevalence of dry eye based on demographics?

What are the causes of dry eye?

What are the most common symptoms?

How many students are aware about dry eye disease?

What methods do they use for management?

1.6 Significance of the study

This research is important due to the fact that prolonged use of laptops and smartphones because of the Covid-19 pandemic can lead to an increase in the prevalence of dry eye among students. Several studies have reported an increase in dry eye since the beginning of the pandemic and no study has been done in Trinidad and Tobago. This research can therefore help get an insight into the effects of Covid-19 on ocular health. In addition the study can also increase the statistical data for Trinidad and Tobago and also the Caribbean. This study can also act as a basis for further research on this topic.

1.8 Delimitation of the study

This study was delimited to UWI undergraduate students, St. Augustine campus Trinidad and Tobago who are less than 35 years old.

1.9 Definition of terms

The definitions were retrieved from the Merriam- Webster Dictionary

1) Awareness- knowledge or understanding of something

2) Demographics- the statistical characteristics of human populations.

3) Dry Eye- a condition associated with inadequate or poor quality tear production and marked by redness of the conjunctiva, by itching and burning of the eye.

4) Covid-19- a mild to severe respiratory illness that is contracted by contact with infectious material or with objects or surfaces contaminated by the causative virus, symptoms may involve; fever, cough, and shortness of breath and may progress to pneumonia and respiratory failure.

5) Meibomian gland - the sebaceous glands of the eyelids that discharge a fatty secretion which lubricates the eyelids and decreases rapid tear evaporation.

6) Pandemic- a disease occurring over a wide geographic area and normally affecting a large percentage of the population.

7) Visual display terminal (VDT)- is a term used, especially in ergonomic studies, for the computer display

8) Prevalence- the percentage of a population that is affected with a particular disease at a given time.

9) rheumatoid arthritis- a usually chronic autoimmune disease that is characterized especially by pain, stiffness, inflammation, swelling, and sometimes destruction of joints

10) Corticosteroids- any of various steroid hormones that are produced by the adrenal cortex from cholesterol.

11) Cyclosporine - an immunosuppressive drug that is used to stop rejection of transplanted organs and in the treatment of rheumatoid arthritis and psoriasis.

12) Tear break-up time (TBUT) - It is a clinical method to assess the stability of the tear film.

13) Presbyopia- a visual condition which becomes apparent especially in individuals who are 40 and over and it causes loss of elasticity of the lens of the eye which results in the inability to focus sharply for near vision.

14) Schirmer's Test- This is a clinical procedure which is done to ensure that the eye produces enough tears.

15) Antibiotics- a substance able to inhibit or kill microorganisms.

16) Rural- an area which is sparsely populated.

17) Urban- an area which is densely populated such as the city.

18) OSDI questionnaire- Ocular Surface Disease Index questionnaire

19) DED- Dry Eye Disease

20) NaFl- Sodium Fluorescein

CHAPTER TWO: LITERATURE REVIEW

2.0 Introduction

This literature review consists of studies relevant to the topic "The Prevalence of dry eye disease" and a total of twenty (20) research studies conducted in various countries in the past. Their outcomes were documented and used as a comparative standpoint for the information acquired for this research study. The information gathered from these twenty (20) previous research studies were based on the objectives:

- To determine the demographic prevalence of dry eye disease.
- To determine the most common symptoms of dry eye.
- To ascertain how many of the students are aware of the dry eye disease.
- To document the various management methods that persons use on their dry eyes.

Global prevalence of dry eye

Palestine

A cross sectional study was done by Shanti et al[7] on 769 subjects age ranged from 18 to 90 years in 16 towns in the Northern West Bank of Palestine[7] to evaluate individuals with DED using questionnaires, tear film break up time test, schirmer test and fluorescein corneal staining. Males represented 364 (47.3%) and females represented 405 (52.7%) of the study population. The prevalence of DED was found to be 64% and it was reported to be associated more with older age and the female gender.[7]

Brazil

A cross sectional study, done by Silvestre de Castro et al[8] did a study on five geopolitical regions of Brazil to determine the prevalence of DED using questionnaires.[8] 3107 people responded 1067 of whom were males and 2032 were females. The prevalence of DED was 12.8% with female participants having a prevalence of 73.6% against 26.4% recorded for the male participants.[8] This again showed that DED is more prevalent in females.

Italy

Rossi et al[9] conducted a study based on the prevalence of dry eye among video display terminal users, 194 individuals participated in the study, 124 participants represented the VDT group while 70 participants represented the control group. Among the control group, 2 (2.9%) individuals had definite dry eye disease while 37 (52.8%) had suspect dry eye disease.[(9)] Among the VDT group 29 (23.4%) individuals had definite dry eye disease while 55 (44.4%) had suspect dry eye disease.[(9)] According to the study the participants with dry eye disease were older and used a VDT for a long period of time.[(9)]

Beijing, China

Jie et al[(10)] conducted a study on 4439 participants 40 years and above to determine the prevalence of dry eye. A further random sample of 1957 subjects from the 4439 participants was then done, 1112 being women.[10] The dry eye symptoms were evaluated with an interviewer- assisted questionnaire, measurement of the TBUT, NaFl staining on the cornea, examination of the meibomian glands and Schirmer's test.[10] Among the participants, symptoms of DED were experienced by 411 subjects, this resulted in the prevalence being 21%.

Johannesburg, South Africa

Gillian[11] did a study on 112 participants to determine the prevalence of dry eye symptoms in Johannesburg, South Africa. Eighty eight were females and 24 were males. Ocular Surface Disease Index (OSDI) questionnaire was used for the study.[11] The prevalence of mild dry eye was reported to be 64%. The author concluded that the high prevalence can be due to Johannesburg's humidity levels and the predominant female participation.[11]

United Kingdom

In a study done in the UK by Vehof et al[12] on 3824 female participants to determine the prevalence of dry eye and associated risk factors. The prevalence of DED was found to be 9.6% of women had DED. Risk factors that were significantly associated with DED were age, asthma, eczema, the presence of any allergy, cataract surgery and rheumatoid arthritis.[12]

Russia

Jonas et al[13] did a questionnaire based study in a rural and urban region in Russia, to assess the prevalence and associated factors of dry eye. [13] A total of 5899 individuals 40 years and above participated and underwent an ocular and general examination.[13] The prevalence of dry eye was 23.1% in women and 14.5% in men.[13]

North India

Based on a study done by Titiyal et al[14] study in North India on 15,625 patients recorded a prevalence of 32% for DED, 9% had mild DED, 61.2% had moderate DED and 28.9% had severe DED.[14] It was also reported that participants who smoke cigarettes and those that wear contact lens had a higher probability of developing severe DED. The prevalence of DED was found to be highest among age group 21-40 years.[14]

Diagnostic categorization of the prevalence of dry eyes

Aditya Rege et al[15] did a study on 4750 patients above 18 years using a questionnaire and further confirmed their suspicions using diagnostic tests. The prevalence of DED was 15.4% with the majority being female patients. Additionally, the study found that the prevalence of dry eye was significantly associated with those above the age of 60 years of age.[15] The tear breakup time was found to be the most reliable of the diagnostic tests conducted and of the patients interviewed in this study, Lipid Anomaly Dry Eye was reported to be the most prevalent (14.48%) followed by Aqueous Tear Deficiency (13.36%) then Mucin Layer Deficiency (3.51%).[15]

Africa

A study carried out by Akowuah and Kobia-Acquah[16] to determine the prevalence of dry eye in Africa using a systematic online literature search, meta-analysis and meta-regression, estimated the prevalence of dry eye to be 42% in Africa.[16] Males were found to have a prevalence rate of 42.1% and for females 44.4%.[16] The study also found that the school population had a dry eye prevalence of 51.6%, than the hospital occupants that had a prevalence of 38.7%.[16]

Ghana

A cross-sectional population-based study carried out on 1316 participants aged 18 to 90 years of age by Kobia-Acquah et al.[17] to estimate the prevalence of dry eye in the Ghanaian population.[17] Out of 1316 participants screened, 69.3% (912) persons were found to have dry eyes where the severity of their symptoms ranges from mild (19.8%), moderate (16.6%), to severe (32.9%).[17] The most common symptom of dry eyes found from this study was sensitivity to light which was reported by 67.1% of the participants. The most affected visual task in this study was reading (49.3%) and the most common exacerbating environmental factor was windy conditions (61.3%) from the dry eyes.[17] The study also recorded a positive relationship between dry eye and increasing age, female sex, arthritis, and ocular surface allergy.[17]

Management Methods of Dry Eye

A study conducted by Rouen et al.[18] in the United States of America, Detroit which spoke about the prevalence, assessment and management of dry eye, of which the data gathered was extrapolated from various studies conducted in the US and other related countries, categorized first line management for dry eye disease to consist of patient education, environmental modifications, dietary modifications, screening for medications that worsen dry eyes, and specific treatment options such as lid hygiene, warm compresses and ocular lubricants.[18] The study recognized secondary treatment options also involving lid hygiene, moisture chamber goggles/spectacles, pulsed heat/light therapy, topical antibiotics and topical corticosteroids to name a few.[18] Tertiary treatment options include oral pilocarpine, soft bandage lenses and rigid scleral lenses.[18] Quaternary treatment options involve topical corticosteroid for longer duration, surgical punctal occlusion and corneal bandage lenses.[18]

Suvarna and Phadatare et al.[19] comprehensively reviewed the dry eye disease management in a study conducted in India which extrapolated data from various studies previously conducted across the world and evaluated the medical management and diagnosis among other aspects of dry eye.[19] This study found that the medical management methods for dry eyes consisted of: patient education, environmental modifications, integration of more vitamin A and Omega 3 Fatty acids into diet, artificial tear substitutes, punctal plugs, autologous serum eye drops, Non-steroidal anti-inflammatory drugs and antibiotics, topical corticosteroids, cyclosporine and surgery.[19] This study found the use of artificial tears in the form of ointments to be most beneficial in the night time as it prolongs duration of action at the cost of temporarily disrupting visual acuity.[19]

Taiwan

Based on the results from a study conducted by Mai et al.[20] which investigated the epidemiology of dry eye disease in Taiwan and its relation to presbyopia and other risk factors, it was seen that the prevalence of dry eyes in men was found to be 6.81% and 16.16% in women of the Taiwan population.[20] This information was obtained using the Taiwan National Health Insurance Research Database's data from 2000-2013. Additionally, this study found that dry eye prevalence peaked in women within the age of 50-74 and men ages 75 and older whereas the incidence in young persons was found to be stable for both men and women.[20] This study also found a significant association between presbyopia and dry eyes.[20]

University of KwaZulu-Natal (UKZN) Westville Campus, South Africa

Another study conducted by Castelyn et al.[21] to investigate the prevalence of dry eyes in university students within the ages of 18-30 however, of black and Indian descent in South Africa.[21] This study utilised a randomised convenient sampling method to select the 100 participants of UKZN's

Westville campus who contributed to the study.[21] The ratio of male to female and Indian to blacks was balanced. Results from the OSDI questionnaire revealed a 41% (41/100) dry eye prevalence and 25/50 (50%) black students were found to be symptomatic of dry eyes in comparison to 16/50 (32%) Indian students.[21] Of these, 12/25 (48%) were black men, 13/25 (52%) were black women, 5/25 (20%) were Indian men and 11/25 (44%) were Indian women.[21] From the clinical tests conducted in this study, 81% (81/100) were found to have dry eyes.[21] Of the black students 82% (41/50) were found to have dry eye and 80% (40/50) for the Indian students.[21] From the 50 male students 34% (17/50) had dry eye symptoms and 86% (43/50) had clinical signs whereas for the females, 48% (24/50) had dry eye symptoms and 76% (38/50) had clinical signs.[21]

Ontario, Canada

Caffery et al.[22] did a study to ascertain the prevalence of dry eyes in Ontario Canada using a population-based cross-sectional survey. Out of a total of 5163 participants screened, 1135 participants were found to have dry eye disease.[22] The prevalence was found to be highest amongst the ages of 55-64 years and lowest within those aged 25-34 years based on this study.[22] This study also found the prevalence to be higher in women than men where the women report a prevalence of approximately 24.7% and men report a prevalence of approximately 18%.[22] Other factors were considered to be irrelevant in this study and as such the prevalence of dry eye in Canada was estimated to be 21.3% which corresponds to approximately 6.3million persons from this sample.[22]

Uparwara Community College, India

Kolla et al.[23] did a study to determine the dry eye prevalence of students of the Uparwara community college in India. The study analysed data obtained from 240 students using the OSDI questionnaire (213males (89%), 27 females (11%)) within the ages of 18-25 years of which, 116

(48.3%) were found to have dry eye symptoms.[23] The study also found that all 116 of the students who experienced dry eye symptoms were visual display terminal (VDT) users and 26 (22%) use it for more than 4 hours a day whereas 90 (78%) were exposed to VDTs less than 4 hours daily.[23] From this information, the study concluded that VDT exposure greater than or less than 4 hours is a risk factor for dry eyes.[23]

France

Ferrero et al.[24] did a study to estimate the prevalence of dry eye in the elderly. Participants were assessed using Schirmer, TBUT and Ocular Surface Index questionnaire.[24] According to the study there were 1045 participants and the mean age was 82.2 years.[24] The prevalence of dry eye disease was determined to be 34.4%.[24]

Singapore

A study was conducted by Tan et al.[25] in Singapore to describe the prevalence and risk factors of symptomatic dry eye disease.[25] The study analysed data obtained from 1004 randomly distributed questionnaires from participants ranging between 15 to 83 years old and the prevalence was found to be 12.3% (123 participants) with a greater prevalence in females than males.[25] The risk factors associated with symptomatic dry eye disease included contact lens wear, those who had previous treatment for dry eye, medication, those having unusual sensitivity of eyes, constant mucous membrane dryness and waking irritation.[25]

Saudi Arabia

Khalid et al.[26] conducted a study to measure the awareness and knowledge regarding dry eye syndrome (DES) among the population of Saudi Arabia via social media questionnaire

distribution.[26] The study consisted of 451 participants within the ages of 18 - 55 years and 242 (53.7%) of the participants reported being knowledgeable about DES whereas 209 (46.3%) reported not having any knowledge on the topic.[26]

China

Qiu et al.[27] did a study to determine the dry eye awareness in the population visiting a general eye clinic in China using a questionnaire.[27] Awareness was found to be low (26.9%, 216/804 participants) and the study found that participants aged 40- 60 had better dry eye awareness and that females (33.8%, 151/447) had a higher awareness than males (18.2%, 65/357).[27]

CHAPTER THREE: METHODOLOGY

3.0 Introduction

This chapter outlined the research design, study size, study population, sample size, sampling procedure, inclusion and exclusion criteria, test and instrument used, data collection procedure, data analysis, legal and ethical considerations.

3.2 Research Design

This study was a descriptive cross sectional designed study, where an online questionnaire based on Dry Eye Disease was sent out to UWI undergraduate students of the St. Augustine campus.

3.3 Study Population

The population of this study included UWI undergraduate students of the St. Augustine campus who were part of different faculties, ethnic groups, gender, but between the ages of 18-35.

3.3.1 Study Site

The study was conducted at the University of the West Indies, St. Augustine campus.

The University of the West Indies (UWI) is a regional University in the Caribbean. The University has three locations, Mona Campus in Jamaica, Cave Hill Campus in Barbados, and St. Augustine Campus located in Trinidad. This campus was established in 1960. [4] There are approximately 17,035 students and 8 faculties including , Faculty of Medical Sciences, Faculty of Science and Technology, Faculty of Engineering, Faculty of Sport, Faculty of Humanities and Education, Faculty of Food and Agriculture, Faculty of Social Sciences and the Faculty of Law. Saint Augustine is located on the north-west side of Trinidad

3.3.2 Inclusion Criteria

The inclusion criteria for this research was, undergraduate students attending the UWI St. Augustine campus who are between the ages of 18- 35, who agree to take part in the study.

3.3.3 Exclusion Criteria

The exclusion criteria for this research were individuals who are UWI St. Augustine, undergraduate students who have cornea defects.

3.4 Sample Size

3.4.1 Sample Size Determination

The study sample was calculated with a sample size calculation software known as Raosoft. This software was used for a population of 17,034 (UWI total students population) calculated at 5% margin of error and 95% confidence interval with the formula below: x=Z(c/100)2r(100-r) n=N x/((N-1)E2 + x) E=Sqrt[(N - n)x/n(N-1)] Where n is the sample size, E is the margin of error, N is the population size, r is the fraction of responses that you are interested in, and Z(c/100) is the critical value for the confidence level c, a minimum sample size of 376 was used. In order to compensate for those who might not be willing to participate in the study, the sample size was increased to 400.

3.4.2 Sampling Technique

The email addresses of students were obtained from their respective departments, a google systematic random selection was used to select 50% of students' emails from each faculty. Consent sheets and questionnaire forms were sent out to those students via their emails. Link to the online questionnaire was sent to students who gave their consent to participate in the study.

3.5 Tests and Instruments

Data was collected via an online questionnaire, this questionnaire consisted of material relevant to Dry Eye Disease, such as symptoms that are related to this disease which gave us an idea as to what the prevalence may be.

3.6 Data collection procedure

- Ethical approval was obtained from the ethics board before starting the data collection.
- The administrative assistant of each department was given a link to the questionnaire and asked to send the questionnaire to 50 undergraduate students. The Google form was also sent to undergraduate students from different faculties via social media apps such as Whatsapp and Instagram.
- The questionnaires were sent out from February 2021, data was collected until April 2021, there were a total of 408 responses, of these, 9 individuals did not meet the requirements of the questionnaire.
- Participants that did not meet the inclusion criteria were disregarded.

3.7 Data Analysis

The data received from the questionnaire were analyzed with descriptive statistics using frequency, percentage frequency and the results were presented in tables.

CHAPTER FOUR: RESULTS

4.0 Introduction

This chapter presents information accumulated from the distributed questionnaires interpreted, analyzed, summarized and presented with tables.

4.1 Demographic profile of the participants

The study consisted of 399 participants, of which 141 (35.3%) were males and 258 (64.7%) were females. Their age ranged from 18-35 years old and most (50.4%) of them were of East Indian descent. Also most (32.1%) of the students that completed the questionnaire were from the faculty of medical sciences (Table 4.1).

Table 4.1: Demographic Profile of Participants

Variables	Frequency	Percentage frequency
Gender		
Male	141	35.3%
Female	258	64.7%
Age		

18-25	386	96.7%
26-30	10	2.5%
31-35	3	0.8%
Ethnicity		
East Indian	201	50.4%
African	75	18.8%
Mixed	114	28.3%
Chinese	3	0.8%
Pakistani	2	0.5%
Caucasian	1	0.3%
Syrian	1	0.3%
Spanish	1	0.3%
South East Indian	1	0.3%

Faculty		
Medical Sciences	128	32.1%
Science and Technology	99	24.8%
Social Sciences	69	17.3%
Engineering	38	9.5%
Humanities and Education	33	8.3%
Food and Agriculture	11	2.8%
Law	20	5%
Sport	1	0.3%

4.2. Objective 1: To determine the prevalence of dry eye disease.

The prevalence of DED recorded in this study was 57.9% (231) and 56 (24.2%) had severe DED (Table 4.2).

Table 4.2: Severity of the DED experienced by the Dry Eye Participants

Severity	Frequency	Percentage Frequency
Mild	89	38.6%
Moderate	86	37.2%
Severe	56	24.2%

4.3 Objective 2: To determine the most common symptoms of dry eye.

The most prevalent symptom found was itchy eyes (92.2%), followed by burning of eyes (89.6%) and excessive watery eyes (87.4%) (Table 4.3).

Table 4.3: Symptoms Experienced by the Dry Eye Participants

Variables	Frequency	Percentage Frequency
Symptoms		
Excessive watery eyes	202	87.4%
Burning of eyes	207	89.6%
Itchy eyes	213	92.2%
Foreign body sensation	187	81%

4.4 Objective 3: To determine the Demographic profile of participants with DED

Out of 231 individuals that had dry eye, 153 (59.3%) were females and 78 (40.7%) were males.It was observed that 225 (97.4%) of them were between the ages of 18-25 and majority (29%) were from the faculty of Medical Sciences (Table 4.4).

Table 4.4: Demographic Profile of Participants with Dry Eye

Variables	Frequency	Percentage frequency
Gender		
Male	78	33.8%
Female	153	66.2%
Age		
18-25	225	97.4%

26-30	6	2.6%
ETHNICITY		
East Indian	117	50.6%
African	46	19.9%
Mixed	60	25.9%
Chinese	3	1.3%
Pakistani	2	0.9%
Caucasian	1	0.4%

Syrian	1	0.4%
Spanish	1	0.4%
Faculty		
Medical Sciences	67	29%
Science and Technology	60	27%
Social Sciences	44	19%
Humanities and Education	21	9.1%
Engineering	22	9.5%

Food and Agriculture	8	3.5%
Law	8	3.5%
Sport	1	0.4%

4.5 To determine the causes of dry eye.

The major causes of dry eye recorded in this study were prolonged length of time on electronic devices (99.0%), length of time doing near work before taking a break (81.4%) and smoking (10%).With respect to the length of time participants spent on an electronic device daily, 118 (51.1%) respondents used it between 10- 14 hours, 58 (25.1%) used it between 5-9 hours per day, and 53 (22.9%) used it for more than 15 hours a day.

Table 4.5: Causes of DED

Variables	Frequency	Percentage frequency
Causes of dry eye		

Time Spent Using an Electronic Device on a Daily Basis		
1-4 Hours	2	0.9%
5-9 Hours	58	25.1%
10- 14 Hours	118	51.1%
≥ 15 Hours	53	22.9%

Length of Time Doing Near Work Consistently Before Taking a Break		
Less than 1 hour	43	18.6%
2-5 hours	152	65.8%
6-10 hours	23	10%
≥ ll hours	13	5.6%
Participants that Smoke		
Yes	23	10%

No	208	90%
Awareness of dry eye		
Yes	73	31.7%
No	134	58.3%
Can’t remember	24	10%

4.6 To ascertain how many of the students are aware of the dry eye disease.

Out of the total number of 399 participants who participated in the study, 114 (28.8%) of the participants reported having some knowledge about the dry eye disease and 83 (83/114) of them have high knowledge of DED. Other responses can be found in table 4.6.

Table 4.6: Awareness of DED among the participants

Variable	Frequency	Percentage Frequency
Awareness		
Yes	114	28.8%
No	237	59.8%
Can’t remember	45	11.4%
Awareness of consequences		
Yes	83	21.1%
No	287	70.7%
Can't remember	32	8.1%

4.7 To document the various management methods people use on their dry eyes.

Majority (86, 37.3%) of the respondents in this study used eye drops, 27 used warm and 98 (42.1%) used no form of management (Table 4.7).

Table 4.7: Methods of managing DED

Management of dry eye	Frequency	Percentage frequency
Eye Drops	86	37.3%
Warm and Cold Compresses	15	6.6%
Warm and Cold Compresses with Eye drops	27	11.8%
Punctal Plugs	2	0.9%
Warm and cold Compresses with Punctal Plugs with	2	0.9%
Lid Scrubs	1	0.4%
No Treatment	98	42.1%

CHAPTER 5- DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter discussed the results presented in chapter four as it relates to the study objectives and research questions. The total number of responses received was 408, of which 399 met the inclusion criteria, these were the responses that were used in the analysis of the study. The prevalence of DED in the study was found to be 57.9%, the major cause of DED were prolonged exposure to electronic devices on a daily basis and the most common symptom of DED was itchy eyes. The most common management for DED was the use of eye drops and it was observed that a lot of individuals are not aware of DED.

5.1 Discussion

5.1.1 Prevalence of Dry Eye Disease

The prevalence of DED recorded in this study was 57.9%. This prevalence is a bit higher than 48.3% recorded by Kolla et al [23] in a study to determine the dry eye prevalence of 240 students of the Uparwara community college in India. The difference in the result could be due to the difference in the sample size as this study had 399 sample size and the one in India was 240 students. In addition, Caffery et al [22] recorded a higher prevalence of DED in women (59.3%) than in males. Similar findings were recorded in the current study and India (Kolla et al).

It was also observed that 225 (97.4%) of the participants, who experienced symptoms of DED in this study belonged to the 18-25 age bracket, while 6 (2.6%) of the participants belonged to the

26-30 age bracket. This was expected as most undergraduate students are younger and are usually in that 18-25 age bracket.

5.1.2 Causes of Dry Eye

The major causes of dry eye recorded in this study was prolonged use of electronic devices. Due to the covid-19 pandemic and the shift for classes to be online, this is believed to be one of the major causes of the increase in dry eye prevalence as the undergraduate students would be forced to spend more time behind the screen of electronic devices for classes, meetings and even those who work. Similar results were obtained from a study done by Kolla et al [23] they found that exposure to visual display terminals (VDTs) for greater than or less than 4 hours was a risk factor for dry eyes.

Also, consistent near work activities without breaks was found to be another major cause of dry eye in this study. When doing near work such as reading, individuals can become focused to the point that their blink rate decreases, this results in drying of the eyes. This was seen in a study done in Ghana by Kobia-Acquah et al [17] where it was observed that reading affected 49.3% of the participants, it was also harder for them to read due to their dry eyes. It was also observed that 10 % of the participants that were considered to have DED smoked, smoking is a risk factor of DED as the smoke irritates the surface of the eye and also dries it out. In a study done by Titiyal et al [14] it was observed that participants who smoked had a higher prevalence of developing severe dry eye.

5.1.3 Symptoms of Dry Eye

The most common symptom of dry eye generally experienced by the dry eye participants in this study was itchy eyes, where 213 (92.2%) of the participants reported experiencing it from a total of 231 responses. A study by Tan et al (2015) in Singapore reported dryness (412/1,004 participants) and itchiness (284/1004) to be the most reported symptoms by their participants which is coherent with the researchers' findings.[25] However, the prevalence of itchy eyes is significantly lower than that seen in the current study and this is likely due to the increased time spent on electronic devices caused by Covid-19 lifestyle changes. Another study done by Kobia-Acquah et al [(17)], 2021 in Ghana which had a total of 1316 participants, found the most common ocular symptom with reference to the OSDI questionnaire to be sensitivity to light which was reported by 67.1 % of participants and this was also the most common symptom experienced in the researchers' questionnaire.[17] Difference in the findings could be due to differences in populations being investigated as Kobia-Acquah's study is based on the general population while the current study was based on only university students. Also, Kobia-Acquah et al [(17)] recorded the most common environmental trigger of dry eye symptoms as windy conditions (61.3 %) against air-conditioned areas recorded in this study. Difference in weather conditions could be the reason for the differences in the findings too.

5.1.4 Methods of management of Dry Eye Disease

Most participants in this study reported that they manage their dry eye with eye drops. Svarna and Phadatare et al. [(19)] found the use of artificial tears in the form of ointments as the most common method of management reported in their study. Ointments stay longer on the surface of the eye

and provide longer relief from dry eyes. Due to the fact that eye drops are convenient and provide a rapid relief from dry eyes, it is a quite common medication used to manage dry eye disease.

5.15 Awareness of Dry Eye Disease

Majority (71.2%) (282/399) of the participants in this study were not aware of DED, and 83 (28.8%) of them reported being very educated about DED. A study conducted by Allam Khalid et al.[26] in Saudi Arabia showed a higher level of awareness than our study as 242 (53.7%) of 451 participants in their study reported being aware of DED.[26] Wei-qiang Qiu et al, 2013 in China showed a similar lack of awareness in its participants where 216 (26.9%) of 804 participants reported being aware of DED.[27] This suggests that there is a need for DED awareness among the students especially during this pandemic.

5.2 CONCLUSION

The prevalence of DED among UWI undergraduate students was found to be 57.9%. It was observed that the prevalence was higher among females (59.3%) than males (55.3%). It was observed that the most common cause of DED was prolonged use of electronic devices, followed by not taking breaks when doing near work activities and smoking. The awareness of DED among the students was less than 30% and most students that had dry eye used eye drops for management.

5.3 LIMITATIONS AND RECOMMENDATIONS

5.3.1 Limitations

1) The covid-19 pandemic limited direct or face to face interaction with the students to do other dry eye tests in the clinic.

2) There is no previous research done based on this topic in Trinidad and Tobago to compare with the current study findings.

3) This is a questionnaire based study, so we cannot verify that these individuals have dry eyes

4) This study is limited to only UWI undergraduate students and not the general population

5.3.2 Recommendations

- More studies related to DED should be done in the Caribbean- This would allow studies on DED to be more comparable as these countries would have a similar

environment and ethnicities as compared to studies cited from different countries.

- Similar studies should be conducted among the Trinidad and Tobago general population

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APPENDICES

1) Exemption Letter-

https://documentcloud.adobe.com/link/track?uri=urn:aaid:scds:US:ea8d74e5-5dee-4a38-9da2-9eb1cf29b398

2) Consent Form-

https://documentcloud.adobe.com/link/track?uri=urn:aaid:scds:US:6a7bb4eb-08eb-4d83-9af7-e0cdff4b5eb6

3) Excel Spreadsheet-

1. What is	2. Which c	3. What is	4) What Fa	5. Do your	6. If yes, a	7. Have yo
Female	18-25 year	Mixed	Food & Agi	No		Never
Female	18-25 year	African	Science an	No	Morning	Never
Female	18-25 year	Mixed	Medical Sc	No		Sometimes
Female	18-25 year	African	Science an	No		Half of the
Female	18-25 year	East Indian	Medical Sc	No		Sometimes
Female	18-25 year	East Indian	Humanities	No		Half of the
Male	26-30 year	East Indian	Science an	No		Most of the
Male	18-25 year	African	Science an	No		Sometimes
Male	18-25 year	East Indian	Law	No	Night	Sometimes