Prevalence and associated factors of symptomatic dry eye among undergraduate students in Hawassa University College of Medicine and Health Sciences, Hawassa, Ethiopia

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ABSTRACT

Objective This study aimed to assess the prevalence and associated factors of symptomatic dry eye (SDE) among undergraduate students at the College of Medicine and Health Science, Hawassa University, Ethiopia.

Methods and analysis Institution-based cross-sectional study was conducted using a systematic random sampling technique. A total of 311 undergraduate students were recruited to execute the study. Ethical clearance was obtained from the ethical review committee of the School of Medicine and Health Science. A standardised self-administered questionnaire was used to collect the data. Data were entered using Epi Info V.7 and cleaned and analysed using SPSS V.23. Binary and multivariable logistic regression analysis was done to select candidate variables and to identify statistically significant factors. Variables with a p value of <0.05 on multivariable analysis were reported as statistically significant.

Results and conclusion The overall prevalence of SDE was found to be 49.4% (95% CI 43.7% to 55.1%). In this study, the history of ophthalmic drop use (adjusted OR, AOR 2.063; 95% CI 1.073 to 3.957) and being second (AOR 11.55; 95% CI 1.10 to 32.56) and third (AOR 4.89; 95% CI 1.86 to 9.59) year student were factors that significantly associated with SDE.

In this study, the prevalence of SDE was significantly high. The factors associated with SDE were the use of ophthalmic drops and the class year of students. Therefore, public health education about protective measures should be considered to minimise the effects of SDE on the quality of life of students.

INTRODUCTION

Dry eye disease (DED) is a multifactorial disorder of the preocular tear film, which results in ocular surface disease. There are numerous factors that can disturb the tear film, in turn, resulting in symptoms of dry eye, and these symptoms include mild transient irritation, burning, itchiness, redness, pain, ocular fatigue, visual disturbance, and persistent dryness.

The International Dry Eye Workshop group (2007) classified dry eye as aqueous-deficient and evaporative.

DED is common and widely diagnosed in ophthalmology as well found to be diminishing the patients’ capacity in performing their daily activities and workplace productivity, and thus affecting their quality of life.

Some of the risk factors for DED include the use of ophthalmic drops, eye disease history, female sex, digital screen usage and wearing eye glass.

The prevalence of DED reported by previous works of literature was 17.0% in China, a systematic review and meta-analysis, 29.25% in India based on patient report,
Methods

Study area and period
This study was conducted at Hawassa University College of Medicine and health sciences from September to December 2021. The college is located in Hawassa city, the capital of Southern Nations Nationalities and Peoples Regional State and Sidama Regional State, and is 275 km away south of Addis Ababa, the capital city of Ethiopia. The annual average temperature of the town ranges from 20°C to 30°C. Currently, the college consists of two faculties, namely medical and public health. In the college, both undergraduate and postgraduate programmes have been provided. As of the 2021 report of the assistant registrar of the College of Medicine and Health Science, about 1641 undergraduate students were enrolled in the college.

Study design and study population
An institution-based cross-sectional study design was applied. The study population was randomly selected undergraduate students learning at the College of Medicine and Health Science, Hawassa University during the data collection period.

Eligibility criteria
All undergraduate students learning in the College of Medicine and Health Science, Hawassa University were considered for inclusion. On the other hand, students with active ocular infection during the study period were excluded.

Operational definitions
SDE: OSDI ≥13 was used to define SDE.14

Moderate SDE: defined as a score of (23–32) on the OSDI questionnaire.14

Severe SDE: defined as a score of (33–100) on the OSDI questionnaire.14

Computer vision syndrome (CVS): is described as a group of eye-related and vision-related problems that result from prolonged computer, tablet, e-reader and cell phone use.15

Sample size determination and sampling technique
The sample size was calculated based on the single population proportion formula by taking the proportion (P) of SDE=50%, a 95% CI and margin of error (d)=5%. Then, the sample size was found to be 384. Since our study population is less than 10000 (ie, 1641), we recalculated the sample using the correction formula; NF=n/ [1+(n/N)] = 384/[1+(384/1641)]; NF=311. Where, NF—is the minimum sample size for population less than 10 000, n—is the minimum sample size if the population is greater than 10 000 and N—is the total population of the study. So, the final sample size for this study was 311.

The study participants were approached using a systematic random sampling technique.

Sampling procedure
Primarily, the list of all students of medicine and health science was obtained from the assistant registrar’s office of the College of Medicine and Health Science, Hawassa University. The total number of students was 1641. Then, the constant K was calculated by taking the ratio of the total study population to the final sample size (ie, 311). The determined value of K was 6. The lottery method was used to select the random start. Out of the first six lists, number 4 was a selected random start. Then, every sixth individual was accessed through their dormitory number. About 19 selected students were not available on the first visit. The next attempt was done on 2 more days and 17 students were addressed. Those (ie, two students) who were still unavailable; the immediate following students in the list were selected.

Variables

Dependent variables
SDE.

Independent variables
Independent variables of this study include sex, class year and history of ophthalmic eye-drops, visual display use, previous eye disease and eyeglass wear.

Data collection tool and procedure
A self-administered adapted and standardised questionnaire that was prepared in the English language was used to assess SDE and potential associated factors. The adapted questionnaire has three parts which gather information on the sociodemographic information of participants, OSDI questions and questions related to factors of SDE. OSDI is the most widely used questionnaire to evaluate DED. In addition, it is viewed as one of...
the gold standards concerning DED diagnosis according to the Dry Eye Work Shop census. Based on the identified constant (K) and dormitory number of the selected students, the questionnaire was delivered to each study participant. Three optometrists were involved in data collection. Those participants whose OSDI scores were greater than or equal to 13 had been considered as SDE disease. Additionally, the participants were classified into categories based on OSDI score: normal (scores 0–12), mild DED (13–22), moderate (23–32) and severe (33–100).

Data quality control
The pretest was done in a 5% sample size (ie, 16 students) among students at the college of technology, Hawassa University. Then, an appropriate word modification was made accordingly to clear misunderstandings. The consistency and completeness of the filled questionnaire were checked before data entry. The objectives of the study, methods, funding source, conflicts of interest, institutional affiliation, anticipated benefits and study outcome were explained to each study participant, describing the right of participants to access the final result and informed verbal consent was obtained from all study participants. We informed the potential subjects of the right to refuse to participate in the study or withdraw consent to participate at any time without reprisal. The collected data were kept confidential throughout the study period.

Data processing and analysis
Data entry was made by using Epi Info V.7. Then, data cleaning and analysis were performed by using SPSS V.23 software. Descriptive statistics were reported using frequency and percentage to present the findings in the form of graphs and tables. Binary logistic regression was executed to select candidate variables for multivariable logistic regression analysis. Then, variables with p<0.25 on binary logistic regression analysis were considered candidate variables for multivariable logistic regression analysis. Multivariable logistic regression was used to identify the association between potential factors and SDE. An adjusted OR (AOR) with 95% CIs calculated from the multivariable logistic regression was used to show the association between SDE and independent variables. Factors with p<0.05 in multiple logistic regression were reported as statistically significant.

Patient and public involvement
This work was conducted exclusively on patient involvement. Patients were not invited to comment on the study design and were not consulted to develop patients’ pertinent outcomes or infer the results. Patients were not invited to contribute to the writing or editing of this document for readability or correctness. There are no plans to distribute the results of the study directly to each study participant.

RESULTS
Sociodemographic data of the respondents
A total of 311 students participated in this study, accounting 100% response rate. About 19 participants were not available on the first visit. The specific time they were avail at the dormitory was known, and all of them (ie, 19 students) had been addressed during the day of the next visit. The majority of the study participants were male students, 176 (56.6%). The mean age of the study participants was 22.19 (±1.410) years, ranging from 19 to 25 years. Twenty-one per cent (n=65) of the respondents exposed that they had a previous history of eye disease within 12 months period while 57 (18.3%) and 61 (19.6%) of the study participants were protective eyeglass wearers and history of ophthalmic drop use, respectively. The majority of respondents, 254 (81.7%), had no awareness of CVS through 170 (54.7%) of the study participants lasted for longer than 6 hours per day in the visual display (online supplemental material 1).

Prevalence of SDE
In this study, the overall prevalence of SDE was 49.2% (95% CI 43.5% to 54.9%); 43.14% (95% CI 39.2% to 47.6%); 24.18% (95% CI 18.4% to 29.3%) and 32.67% (95% CI 26.6% to 37.5%) of them have mild, moderate and severe SDE, respectively (online supplemental material 2).

Factors associated with SDE
In the current study, the sex of respondents, class year, a history of eye disease, wearing eyeglasses, history of self-medication, CVS awareness and VDU more than 6 hours per day were factors that showed statistically significant association with SDE in a bivariable logistic regression analysis. However, in a multivariable logistic regression analysis history of self-medication and class year remained significantly associated with the occurrence of SDE.

The findings of this work indicate that the likelihood of the occurrence of SDE was nearly 6 times (AOR 5.99; 95% CI 1.10 to 32.56) and 12 times (AOR 11.55; 95% CI 2.12 to 62.94) more likely among second and third-year undergraduate students when compared with that of sixth-year students. This study also revealed that those participants with a history of ocular self-medication were two times more likely (AOR 2.06; 95% CI 1.07 to 3.96) to have SDE when compared with that with no history of ocular self-medication (online supplemental material 3).

DISCUSSION
The overall prevalence of SDE in this study was 49.2% (95% CI 43.5% to 54.9%). The use of ophthalmic drops and class (study) year were factors that were significantly associated with SDE. This finding is important for strategists to plan future interventions and for clinicians to offer information-based decisions for clients.

The overall prevalence of SDE in this study is comparable to those studies conducted on Ghanaian undergraduate University students, in Riyadh, Saudi

However, a study that was held in South-Arabia and in College students in India, as well as to that of the Nigerian adult population. The consistent results may be due to applying the OSDI questionnaire in the diagnosis of DED.

However, this study revealed a lower prevalence of SDE when compared with the research results conducted in other countries like the study result that was done on university students in Mexico (70.4%) in Chinese high school students (70.5%), in Chiang Mai University medical students, Thailand (70.8%); in medical students in a tertiary hospital in India (36.81%), in Palestine (64%), in Dubai (62.6%) and in Ghana (69.3%) using OSDI questionnaire. The lack of uniformity in the results may be due to the difference in the age of participants. For instance, studies that were conducted in Dubai and India included a population aged above 40 years, who are at high risk of DED. In addition, it may be due to differences in sample size, humidity and use of a visual display terminal for an online lecture.

In contrast, this study revealed a higher prevalence of SDE when compared with a systematic review and meta-analysis in China (17%) and the research outcomes reported in the USA (6.8%), in Brazil (12.8%), in Open University in Thailand (17.5%), in university students in Bangkok, Thailand (8.15%), in Indonesia (27.5%), in Singapore (12.3%), in India (40.9%), in Philippines (22.9%), in Malaysia secondary referral hospital (33.8%), in Saudi Arabian population (32.1%), in Lebanon (36.4%), in South-West Nigeria (28.2%) and in South Nigeria (27.4%). The discrepancy across the study outcomes might be due to differences in the study period and data collection tools. For example, the study that was done in India reported DED based on subjective tests while that of Malaysia used objective tests alone. Furthermore, the geographical differences of the country and differences in the age of participants may be considered contributing factor for the occurrence of DED. On the other hand, the higher prevalence of DED in the current study may be subject to shifting the teaching-learning process to primarily digital due to the SARS-CoV-19 pandemic.

In this study, class year (ie, second-year and third-year student) and use of ophthalmic drops were factors that were primarily associated with SDE in multivariable logistic regression analysis. As of the study that was conducted in Mexico, also in this study, the use of ophthalmic drops doubles the occurrence of SDE when compared with unused participants. As described by Kofi et al the occurrence of SDE among self-medicated undergraduate university students was found be more than four times. The association might be due to nearly similar mean age in study participants of that of Mexico, Ghana and this study. However, a study that was held in South-West Nigeria indicated that those who had been on ophthalmic drops prior to the study were found to be 4% less likely diagnosed with dry eye. This discrepancy might be due to the double utilisation of spectacles by the study participants in that conducted in Nigeria when compared with the current study.

In addition, in this research, the class year (study year) of the students revealed a statistically significant association with SDE. Being a second-year and third-year student was 6 times and 12 times more likely to be significantly associated with SDE when compared with sixth-year students. This might be due to the fact that second-year and third-year students spent a long time reading which reduces blinking rate, and in turn, provides an opportunity for dryness of the eye when they are compared with sixth-year students, who spent much of their time on clinical practice.

On the other hand, in this study, more than 6 hours of visual display device use had been not associated with SDE disease. We hypothesise that it could be due to low cumulative years of visual display devices used in the study population because it is common for students in low-income countries such as Ethiopia to have personal visual display devices such as personal computers and Smartphone’s when they join the university. Moreover, the authors recommend further research on class year versus visual display use of students for academic purposes per day.

Overall, this study provides an indication of how severe is SDE among the study population and further gives a clue on the risk factors of SDE for ophthalmologists, optometrists and other eye care professionals who are engaged in treating clients.

This study was conducted using a questionnaire that is widely available in ophthalmology clinics globally and recommended as a gold standard tool in the diagnosis of DED. However, its major limitations are that the data were collected from a single medical university hence not representing all universities in Ethiopia, not separating out specific eye-drops that are associated with DED, and never performing the clinical evaluation. As a result, it needs further studies that will incorporate all medical universities in Ethiopia and explore specific eye-drops that are associated with DED, and further diagnosis of DED using clinical assessment techniques to explore the relationship between symptoms and signs of DED. Also, the authors recommend researchers execute further studies on SDE versus the academic performance of students.

**CONCLUSION**

In this study, the prevalence of SDE was significantly high. Therefore, the condition is a common health problem among students in the College of Medicine and Health Science, Hawassa University, Ethiopia. The use of ophthalmic drops and being a second-year and third-year student were factors associated with SDE. Therefore, public health education about protective measures should be considered to minimise the effects of SDE on the quality of life of students.
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