INTRODUCTION

Recently, the number of computer users and display devices with a monitor (screen) is increasing. In Indonesia there are 143 million internet users, making Indonesia one of the top five internet users in the world. Most of the internet users are young people and teenagers, even though adults user has also increased. Excessive screen time may result in imperfect blinking, evaporation of tears, and ultimately leading to Dry Eye Syndrome (DES). Substantially, DES could affect visual acuity and quality of life, as the symptoms often disturb daily activities, such as reading, writing, or working in front of the screen. Undiagnosed dry eye may cause unstable conditions on the ocular surface, leading to corneal damage, ulcer, and cicatrix due to corneal irregularity.

Dry eye is more often found in the elderly, especially in the 4th decade. This fact influences the limited number of dry eye research in teenagers and young adults. Moreover, the COVID-19 pandemic has increased screen time among students as learning is generally shifted to online mode and the use of gadgets as learning tools is unavoidable. This study is to show the description of screen time and DES events in students, especially medical students of UIN Alauddin, Makassar.

MATERIAL AND METHODS

This study uses descriptive and cross-sectional methods. The study was conducted in the School of Medicine at UIN Alauddin Makassar and RSUD Haji Makassar from December 2020 to April 2021. The subjects were students of The School of Medicine at UIN Alauddin Makassar, aged 17-24 years old, who were undergoing online learning. The inclusion criteria included those who were willing to fill the questionnaires and take the examinations. Exclusion criteria were incomplete questionnaire filling, history of eye surgery, the use of soft contact lenses, abnormal palpebral anatomy, the use of antihistamine eye drops medication, and history of systemic disease.

The data collection was undertaken using online questionnaires and ophthalmological examinations. Written and signed informed consent from the subject was obtained before the data collection was performed. The questionnaires consisted of the daily log and the Ocular Surface Disease Index (OSDI) questionnaire filled in and submitted by the medical students via a Google form. The daily log included the activities using gadgets as learning is generally shifted to online mode and the use of gadgets as learning tools is unavoidable.

Keywords: dry eye, pandemic, screen time.

Ophthalmological examinations for DES (blink rate, tear break-up time, Schirmer tests 1 and 2) were performed on the study subjects at RSUD Haji Makassar. The blink rate measurement was done observationally during 1 minute usage of the smartphone. The normal blink rate was 12-18 times/minute. The examination of the anterior segment of the eyeball was performed using a slit lamp biomicroscope. The subjects had Tear Break-up Time (TBUT) examination by applying a fluorescein strip combined with 1 drop of balanced salt solution on the inferior part of conjunctival fornix of the eye. The subjects were asked to blink three times, then look straight ahead without blinking. The time between the last blink and the onset of dry spot on the ocular surface was identified using a cobalt blue filter and measured using a stopwatch. Normal TBUT was >10 sec, 6–10 sec was classified as having mild dry eye, and ≤5 sec was identified as having severe dry eye.

The Schirmer test was performed by placing the Schirmer strip paper on the inferior conjunctival sac in the temporal third of the inferior palpebral of both eyes. The subjects were asked to keep their eyes to remain open then asked to blink. After 5 min, the strip was taken off, and the length of the wet strip paper was measured. The examination result was considered normal when the wet strip was >10 mm, and tear deficiency if <5 mm long. Each examination was repeated 3 times and the average value was calculated. All the data were analyzed using SPSS version 25 descriptively and presented in the form of a frequency distribution table.

RESULTS

A total of 44 students became the subjects of this study. The questionnaires contain the subject characteristics, screen time, and the OSDI index. The collected data were presented in tables. Table 1 shows the characteristics of the study subjects, namely age, gender, screen times, use of contact lenses, use of fans or air conditioners (AC), and non-screen duration. Most of the study subjects were 22 years old (27.27%) and female (65.91%). The average screen time for the online class was about 8.14 hours per day and the average non-screen time for other online activities was 9.57 hours per day. There were nine subjects (9.09%) who wore contact lenses. The average use of the fan/AC was 12.55 hours per day. The average non-screen duration was 6.30 hours per day.

Table 2 shows the distribution of dry eye symptoms using the OSDI index. All study subjects had dry eye symptoms. It was found that most study subjects (n=28 (63.64%)) suffered from severe dry eye symptoms. Study subjects suffering from moderate dry eye symptoms were 14 subjects (31.82%). Study subjects who suffered from mild dry eye symptoms were 2 persons (4.55%). Table 3 shows the distribution of dry eye symptoms based on gender. In the category of mild dry eye, all two subjects (100%) were females. In the moderate category of mild dry eye, all two subjects (100%) were females. In the moderate category of mild dry eye, all two subjects (100%) were females.

Table 4 shows the distribution of DES Examination parameters. The data are expressed as the mean ± standard deviation.
dry eye category, there were 8 females (57.14%) and 6 males (42.86%). In the category of severe dry eye, there were 19 females (67.86%) and 9 males (32.14%).

Table 4 shows the data of dry eye signs examinations. The average blink rate was 11.36±7.45 times per minute. From the TBUT examination, the average value was 10.58±2.69 seconds. The results of the Schirmer 1 examination showed a mean value of 23.67±12.76 mm. The mean of the results of the Schirmer 2 examination was 20.21±11.64 mm.

**DISCUSSION**

Based on age, this study showed that most subjects were 22 years old. The incidence of dry eye increases with age due to decreased function of the lacrimal gland,15 but in this study, we cannot conclude that there is a relationship between age and the incidence of dry eye due to the adjacent population. In the younger age group, it was reported that the incidence of dry eye increased due to the duration of the screen time which decreased the blink rate and increased the evaporation of the tear film.16 The results showed that the average duration of screen time was high, which was about 17.7 hours per day. A survey by the Indonesian Internet Service Providers Association (APJII) found that on average internet users in Indonesia (35.3%) access the internet for 1 hour per day, around 9% or 20 million subjects use the internet excessively (3% use 7-9 hours, and 6% use >9 hours).17 Based on the age of internet users, most users in Indonesia are 18-25 years old, which is equivalent to almost half of the total internet users in Indonesia. In a study involving 259 smartphone users aged 19-25 years in Jakarta, 28% used the internet <6 hours, while 72% used the internet >6 hours per day.1 Research on medical students in India shows that the majority of students (67%) spend 45 hours/week using the internet, the largest percentage is to send messages via email (36.6%), followed by academics (35.2%), pleasure (19.2%), and social networks (10%).18 The higher screen time in this study was likely due to the online learning system during the pandemic, which encouraged students to spend much more time using computers or other gadgets.

This study found all stages of DES symptoms were more frequent in women than men. Several studies have reported the same results, where the presentation of women is greater than that of men. The prevalence of DES was greater in women (16.7%) than men (11.4%).19 Other studies by Syawal et al. in Makassar also reported that dry eye was more common in women than men with a ratio of 2:1.20 A study in Sumatra reported a prevalence of 32.7% of DES in men and 22.8% in women.21

Genders can cause observable differences at both the molecular and physiological levels, in terms of the production of water layers in the eye, tear stability, the number of blinks, and even ocular immune function that may trigger DES.22 Hormonal factors, including levels of sex hormones as well as hormonal cycles in women, affect ocular structure and function. Lower levels of androgens in women have also been associated with DES.23,24 One of the risk factors of DES is female, it is thought to be due to the role of hormones in the stability of the tear film.25 Based on the OSDI score, most of our subjects experienced moderate and severe dry eye symptoms. Similar research involving 350 students reported that 27% had normal eye dryness, 16% had mild eye dryness, 28.5% had moderate eye dryness, and 28.5% had severe eye dryness.21 We found that the average values of TBUT, Schirmer 1, and Schirmer 2 test results were normal, while the average blink rate was lower than normal. Blink intervals vary from person to person, but healthy subjects blink roughly 20 times per minute on average.26,27 Phadatere and Messmer in 2015 put forward the theory that the occurrence of dry eye on smartphone use could be triggered by the activity of the eye staring long at the screen, thereby reducing the blink rate and increasing the length of exposure to the ocular surface. This may lead to instability of the tear film that causes dry eye complaints.28,29 Moon et al. made a similar statement that the reduced frequency of blinking rates during prolonged smartphone use could lead to faster evaporation of the tear film, which could result in dry eye.30

The result showed that most of the subjects had a low blink rate. This will reduce the amount of moisture that the eyes can absorb from tears. Blinking helps to remove any debris from the eyeball and flushes out the fresh tears that have been produced. The retina will receive a clearer and brighter image because of the coating of tears on the surface of the eyeballs. Blinking also provides oxygen and nutrients to the eye, ensuring that it remains healthy and comfortable.26,27

Several studies indicated that the appearance of symptoms is adequate to diagnose dry eye as there is no definite single test to diagnose dry eye disease. However, symptoms alone are not sufficient for the diagnosis of dry eye because many ocular surface abnormalities and tear disorders show the same symptoms.31 We performed both subjective and objective examinations for dry eye. We also obtained the average screen time of subjects in this study. However, there were several limitations, namely limited information about other factors that were likely to affect the results of the study, such as smoking habits and disease history. Another limitation is the absence of a control group, therefore the relationship between screen time duration and DES symptoms and signs cannot be evaluated.

From the results of the study, it can be concluded that the average duration of screen time in medical students of UIN Alauddin Makassar is 17.7 hours per day and the subjective examination of DES with the OSDI questionnaire shows that most medical students of UIN Alauddin Makassar experience severe dry eye symptoms and a low blink rate.

**CONCLUSION**

This study showed that the average screen time of the subjects was 17.7 hours. Most subjects (63.64%) had severe dry eye symptoms and low blink rate (59.09%). The ophthalmological examinations (TBUT, Schirmer 1 and 2 tests) revealed normal results and a low blink rate. It is recommended that future studies can include a control group to be able to show the link between screen time duration and DES symptoms and signs.
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CONFLICT OF INTEREST
All authors declared that there is no conflict of interest regarding this article.

ETHICAL CONSIDERATION
The procedure follows the principles of the Declaration of Helsinki, and its use has been approved by the Ethics Committee of UIN Alauddin University Makassar, Indonesia (No.B.064a/KEPK/FKIK/II/2021).

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AUTHOR CONTRIBUTION
All authors have contributed to the research process, including preparation, data collection and analysis, drafting, and final check of the manuscript.

REFERENCES


