

Original Research

Comparison of Eye Fatigue Incidence Between Male and Female Medical Students with Refraction Error

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Abstract—Eye fatigue is one of main problems faced by students during their education. The female gender is known to have a higher risk of eyestrain than the male gender. This study was conducted to analyze the differences in eyestrain event of medical students with refractive error based on gender. This research was an analytic observational study with cross-sectional design. Male and female students with refractive errors, aged 18-20 years old, and willing to participate in the study were included. Eyestrain was measured using Visual Fatigue Score questionnaire in Indonesian. Chi Square analysis was carried out to analyze the differences in eyestrain event of medical student with refractive error based on the gender. Results: There were 117 respondents in this study, which consisted of 57 male students and 57 female students, both were with refractive errors. Of the 117 respondents, 62 respondents experienced with eyestrain, with details of 24 were male students and 38 were female students. Chi Square analysis obtained a P value of 0.001 which means significantly different. In addition to refractive errors, gender is another variable that can affect the event of eyestrain in medical students. Prevention efforts need to be done to overcome this problem.

Keywords: eye fatigue, gender, refraction error, medical student

Abstrak—Kelelahan mata merupakan salah satu masalah utama yang dihadapi mahasiswa selama menjalani pendidikan. Jenis kelamin perempuan diketahui memiliki risiko kelelahan mata yang lebih tinggi daripada jenis kelamin laki-laki. Penelitian ini bertujuan untuk menganalisis perbedaan kejadian kelelahan mata pada mahasiswa kedokteran dengan gangguan refraksi berbasis gender. Penelitian ini merupakan penelitian observasional analitik dengan rancangan *cross sectional*. Mahasiswa atau mahasiswi kedokteran dengan gangguan refraksi, berusia 18-20 tahun, dan bersedia mengikuti penelitian dimasukkan ke dalam penelitian. Kelelahan mata diukur dengan menggunakan kuesioner *Visual Fatigue Score* dalam Bahasa Indonesia. Analisis Chi Square dilakukan untuk menganalisis perbedaan kelelahan mata pada mahasiswa dan mahasiswi kedokteran dengan gangguan refraksi. Responden penelitian ini berjumlah 117 yang terdiri dari 57 mahasiswa dan 57 mahasiswi dengan gangguan refraksi. Dari 117 responden tersebut, 62 responden mengalami kelelahan mata, dengan rincian 24 adalah mahasiswa dan 38 adalah mahasiswi. Analisis Chi Square didapatkan nilai $p = 0,001$ yang berarti bermakna signifikan. Selain gangguan refraksi, gender adalah hal yang dapat berpengaruh pada kejadian kelelahan mata pada mahasiswa. Upaya pencegahan perlu dilakukan untuk dapat mengatasi hal tersebut.,

Kata kunci: kelelahan mata, gender, gangguan refraksi, mahasiswa kedokteran

INTRODUCTION

Use of the vision senses for long periods of time with a low level of illumination can lead to a condition called eye fatigue or asthenopia [1]. This condition is most frequently encountered by students during their education, with as many as 67.9% of students in Lebanon experiencing eye fatigue [2]. A higher prevalence occurs in medical students in Bali, with a percentage of 90% [3]. Vision impairment is the most frequent disorder experienced by medical students [4,5]. This is due to the fact that medical students often work in close proximity and do less physical activity, such as sports [6,7].

Individual, environmental, and occupational factors are thought to influence the occurrence of eye fatigue [8]. Eye fatigue is usually triggered by the exhaustion of the cylindrical muscles of the eye that accommodate maximum over long periods of time [9]. Women are said to have a higher risk of experiencing eye fatigue than men. It is caused by the

estrogen hormone in women, which triggers the occurrence of dry eyes. Dry eyes are one of the most common symptoms of eye fatigue [10]. Women tend to have a sense of diligence and caution so the eyes are required to focus more to avoid mistakes [11]. Previous studies have found that female students have a severe eye fatigue rate of 35.1%, a moderate rate of 40.4%, and a mild rate of 24.6% [12]. The risk of fatigue in students with refractive disorders is also 6.59 times higher compared to those without refraction [13].

As far as the author's research is concerned, there is not much research on eye fatigue rates that focuses on gender differences. Hence, to support the theory that women have a higher tendency to eye fatigue than men, the researchers felt interested in looking at the phenomenon and comparing it between male and female students of medical faculty with refractive disorders.

METHOD

An analytical observational design with a cross-sectional approach is used in this study. For the selection of samples, we used the consecutive sampling technique with inclusion criteria: registered as male or female student at Medical Faculty University of Warmadewa, willing to undertake research by filling in informed consent, aged 18–20 years old, and using a visual aid or glasses. Male or female students who have a history of medication that affects eye accommodation, suffer from certain chronic eye diseases, or have had eye surgery are excluded from this study. Consecutive sampling allows data collection until the number of samples is met [14]. To determine sample size, we used the large formula for a cross-sectional study. The proportion in the group referred to in the Munif study (2020) is 92.3%, which is the proportion of eye fatigue in medical students with refractive disorders [3]. Based on this calculation, we obtained 114 samples, divided into 57 males and 57 females.

The instrument used was a questionnaire covering the first part of the approval sheet and the second part containing the data of the respondents, namely age, gender, and the visual fatigue score quiz for the Indonesian version. The Visual Fatigue questionnaire adopted by Vardanjani et al. (2014) has 15 closed questions related to eye tension, visual impairment, problems on the surface of the eye, and symptoms perceived beyond the eye area, with validity test values declared valid because $r_{count} > r_{table}$ ($r_{table} 20 \text{ people} = 0.4438$) and Cronbach's Alpha rehabilitation test with a result of 0.94 [15]. The results of this questionnaire measurement are classified as non-eye fatigue (score 0-2.5), mild eye fatigue (score 2.6-5), moderate eye fatigue (score 5.1-7.5) and severe eye fatigue (score 7.6-10) [12,15]. This research was carried out after a declaration of ethics was passed by the Research Ethics Commission of Faculty of Medicine Udayana University with no. 986/UN14.2.2.VII.14/LT/2023.

The univariate analysis was performed to describe the distribution of frequency and percentage for age variables, gender, refractive disorders, eye fatigue, and fatigue rate. To analyze the differences in the degree of fatigue in students and medical students with refractory disorders, a bivariable analysis was carried out in the form of a chi-square test with a P value 0.05 considered meaningful.

RESULT

The data collection process was carried out in April 2023 and obtained a total of 114 people, consisting of 57 male students and 57 female students, with the characteristics of respondents listed in Table 1.

The age distribution indicated that the majority of respondents were 19 years of age, which was 42 (37.0%). Eye fatigue was measured using a visual fatigue questionnaire score, and 62 (54.6%) respondents experienced eye fatigue and 52 [45.6%] experienced non-eyed fatigue. The distribution of eye fatigue included: mild 36 (31.6%), moderate 23 (20.1%), and severe 3 (2.7%). The total number of respondents suffering from refractive disorder for a long period of more than 5 years was 71 (62.3%), and the highest number of types of refraction disorder was myopia with 78 (68.4%) respondents.

Table 1
Respondents Characteristics

Respondent Characteristics	Frequency	Percentage [%]
Sex (n=114)		
Male	57	50,0
Female	57	50,0
Age (n=114)		
18 years old	34	29,6
19 years old	42	37,0
20 years old	38	33,0
Eye Fatigue (n=114)		
Yes	62	54,4
No.	52	45,6
Eye Fatigue Level (n=62)		
Mild (2,6-5)	36	31,6
Moderate (5,1-7,5)	23	20,1
Severe (7,6-10)	3	2,7
Periods Suffering Eye Fatigue (n=114)		
<5 years	43	37,7
≥5 years	71	62,3
Type of Refractive Error (n=114)		
Myopia	78	68,4
Hypermetropia	0	0,0
Astigmatism	13	11,4
Myopia-astigmatism	21	18,4
Hypermetropia-astigmatism	2	1,8

Table 2 shows that male respondents in the study experienced eye fatigue of 24 (42.1%) and female respondents experienced eye fatigue of 38 (66.7%), with a P value < 0.05, meaning that there is a significant difference between the incidence of eye fatigue in male and female medical students with refractive disorders.

Table 2
Chi-Square Test Results Difference in Occurrence of Eye Fatigue in Students and Students with Refractive Disorder

Variable	Eye Fatigue		P Value
	Yes	No	
Male Students (n=57)	24 (42,1%)	33 (57,9%)	0,001*
Female Students (n=57)	38 (66,7%)	19 (33,3%)	

DISCUSSION

Medical students are reported to have a very high prevalence of eye fatigue, also known as asthenopia [12]. This study also found a significant prevalence of eye fatigue, affecting 62 subjects (54.4%). Munif et al [2020] also reported that 88.5% of medical students had eye fatigue [3]. Medical students are reputed to follow a more rigorous curriculum, necessitating more utilization of computers and reading materials compared to non-medical students, who

often spend only a few hours a day to studying [16]. The prevalence of eye fatigue in this research was dominated by a mild level (31.6%). Contrary to this result, Wijayanti's (2019) revealed that a majority of the participants, who were health students in Malang, reported a moderate degree of eye fatigue [17]. Variations might arise due to disparities in the questionnaire employed. Furthermore, the duration of screen exposure and the utilization of electronic devices might also impact the levels of eye fatigue [18].

Tendencies to have eye fatigue are more susceptible to refractive abnormalities than those without refraction disorders. Refractive disorder is one of the most common eye diseases among students [19]. Studies conducted in India indicate that myopia is the most prevalent refraction disorder, especially among medical students. Of the 233 students involved, 123 students (52.78%), suffered from myopia [20]. Despite having received corrective lenses, the tendency to experience eye fatigue persists, especially when performing activities that require a person to focus on an object for a long time [21]. Wearing glasses or contact lenses is also known to cause dry eyes. It can be triggered by excessive eye activity or inappropriate use of sunglasses or lenses [22]. In addition, the use of glasses or contact lenses with excessive eye activity can cause the eyeball to dry quickly and can result in eye fatigue as a result of inappropriate and uncomfortable use of sunglasses or lenses. Studies conducted in Bandung indicate that myopia is the most common refractive disorder that causes eye fatigue, followed by astigmatism. This is because myopia will cause a physiological reaction in the eye, so the subject will be closer to the eye's distance from the object to obtain optimal vision. The need for greater convergence leads to symptoms of eye fatigue [13].

Sawaya et al. (2020) found different results compared to this study. The study found no significant differences between male and female students in the rate of eye fatigue with refractive disorder. This may be due to differences in the structure of the research instrument. The research instruments used in that study included demographic factors, the presence of electronic media usage, the type and duration of use, the reason for using electronic media, whether one is suffering from refractive disorder or not, symptoms of eye fatigue, and the preventive efforts undertaken [2]. The visual fatigue questionnaire is the instrument chosen to be used in this study. The instrument assesses eye fatigue based on what is associated with eye tension, visual impairment, problems on the surface of the eye, and symptoms felt beyond the eye area [15].

There are a number of studies that mention that there are no significant differences in the prevalence of eye fatigue in women and men, but there are studies that are consistent with these findings. These variations can be influenced by various factors. The differences in pain thresholds and lifestyle differences between men and women are believed to be factors affecting eye fatigue in women [23]. The theory already mentions that hormonal factors trigger a higher risk of fatigue of the eyes in women than in men. High estrogen levels in women affect the eye glands and cause dry eye symptoms. Women also have tear layers that thin faster [24,25]. Women are also more careful and cautious when performing tasks, therefore they will be more focused on concentrating to avoid workplace neglect [11].

This research has some number of limitations. Data collection was done through questionnaires, so there is a high risk of human error causing respondents to make a mistake in filling in the details of the available questions. The visual fatigue questionnaire used was a dichotomized instrument with answers only 'yes' or 'no', hence it's more prone to be biased. The questionnaires in this study also only describe the results of eye fatigue without describing the complaints experienced by respondents. The use of cross sectional design has some weakness, include the data was studied at one time period and not being followed up on.

CONCLUSION

In conjunction with refractive problems, gender serves as a significant determinant in the prevalence of eye fatigue among medical students. There is a greater prevalence of eye fatigue among female medical students compared to male students. The observed

phenomenon may be attributed to various reasons, including lifestyle choices and hormonal fluctuations that are specific to female students. The findings of this study provide support for the implementation of preventive measures by medical institutions to mitigate the development of eye fatigue among their students.

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