THE STATUS OF MYOPIA REFRACTIVE ERROR FROM 2018 UNTIL 2021 AMONG AGED 30 TO 35 YEARS OLD IN A PRIVATE OPTOMETRY PRACTICE, DUNGUN, MALAYSIA: RETROSPECTIVE DATA

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ABSTRACT

Introduction: Myopia or also known as near-sightedness is a common visual impairment. Myopia usually started in children and the changes does occur to individuals across age groups. It is tightly linked or commonly related among young individuals which are children and teenagers. Study or research regarding the refractive error changes among adults especially among pre-presbyopia age is under-explored as past research does not collect data for the changes among individuals aged more than 30 years. **Aim:** To evaluate the myopia refractive error changes among adults aged 30 to 35 years old at a private optometric practice, Dungun district, Terengganu state, Malaysia from 2018 until 2021. **Methodology:** This retrospective study was conducted at ArRayyan Optometry, Dungun, Terengganu. All patient record aged 30 to 35 years old from 2018 until at the practice were reviewed. Patients with record having history of ocular surgery as well as ocular and systemic diseases were excluded. The onset of myopia was stipulated at 14 years old. Demographic and mean spherical equivalent refractive error (SER) were collected and analysed. **Results:** Fifteen generally healthy myopic participants mean age of 33.07 ± 1.79 years were met the criteria stipulated. There was a statistically significant increment in myopia refractive error changes in adults aged 30 to 35 years old (p<0.001). **Conclusion:** Myopia refractive error changes could not only occur in children and teenagers but could also demonstrate in adults aged 30 to 35.

KEYWORDS: myopia, pre-presbyopia, adults, sphere equivalent refractive error, refractive error

INTRODUCTION

Myopia or also known as near-sightedness is a common visual impairment as it affects an individual vision when looking at distance as the accommodation of the eye is relaxed (Smith & Walline, 2015) and the refractive error to define it is at least -0.50DS or more (Holden et al., 2015). It becomes major concern globally especially in East and South East Asia regions (Lam, et al., 2012; Mak et al., 2018) whereby it's condition is associated with an increased risk of several ocular diseases including retinal detachment, glaucoma, cataract, visual impairment, and blindness (Huang et al., 2015). Holden et al., (2016) stated that almost 30% of world populations are having myopia and the trend are expected to increase up to 50% of global population in 2050.

Myopia refractive error changes do occur to individuals across age groups. Verkicharla et al., (2020) discovered that the total means of the refractive error changes ranged from -0.07 ± 0.02 D (standard error) to -0.51 ± 0.02 D (standard error) across age groups, with children aged 6–10 years seeing the greatest annual change in refractive error, while adults aged 26–30 years experiencing the least. Similar pattern was also found by Polling et al., (2022). Children with spherical equivalent refraction (SER) -3 D at 10 years were all having high myopic (SER -6D) in their adult age. Meanwhile, children with SER between -1.5 D and -3 D at 10 years had a 46.0 percent risk of high myopia. Children with SER between -0.5 D and -1.5 D had a 32.6 percent risk of high myopia. However, the rate of increasing SER becomes slow in line with the increment of age, whereby the refractive error stabilizes at the age of 15 years.

Although the pattern of myopia refractive error has already reported in previous studies, the pattern of changes is under explored among populations aged 30 to 35 years old. Therefore, this study was aimed to evaluate the myopia refractive error changes from 2018 until 2021 among aged 30 to 35 years old.

MATERIALS AND METHODS

Data collection was conducted at ArRayyan Optometry, Dungun District, Malaysia. Dungun is a coastal district in Terengganu State which is located about 350 kilometres from Kuala Lumpur. Majority of the Dungun population is Malay which makes up about 97.3%, while Chinese, Indian and other population form 2.1%, 0.2%, and 0.4% (*Department of Statistics Malaysia*, 2020). Majority of areas in the district are rural. Most of the population in the district involves in petroleum industry activity since Dungun is located next to Kerteh, known as the petroleum and gas refinery area. However, there are still small pocket of the population take part in fishery, farming, and small trading.

Ethical approval for this study was obtained from International Islamic University Malaysia (IIUM) Research Ethics Committee (IREC) (IREC 2022-KAHS/DOVS/5). The sample size was measured using G*Power© version 3.1.9.4 software, Universität Düsseldorf. The effect size was chosen at 0.40 value, alpha error probability was 0.05, and power of study was 0.80. Number of measurement as well as number of groups were four, respectively. F-test with repeated measure ANOVA option was chosen and the minimum subjects calculated through the software to achieve 80% power of study was 12. This retrospective work started in September 2022 and ended in August 2023. Patient record aged 30 to 35 years old from 2018 until 2021 at ArRayyan Optometry were reviewed thoroughly and the refractive error data were taken. Onset of myopia was set between fourteen and 20 years old because the changes of refractive error is slowing down at the stipulated age (Trier et al., 2008). Patients with hyperopia, emmetropia ranged from +0.50DS until -0.25 DS and astigmatism more than -2.00DC were excluded. Patient with record having systemic diseases which include diabetes mellitus, hypertension and cardiovascular problem, active ocular allergy, refractive eye surgery, ocular trauma, cataract, and other media opacities, consume any drugs as medication, pregnancy, lactating, as well as neurological injury which may impact the eye system were also excluded in this study.

The review of the data in the practice discovered fifteen patients met the inclusion and exclusion criteria as stipulated. All patients were undergone non-cycloplegic refraction from 2018 until 2021 and the objective refraction using retinoscopy, as well as subjective refraction were conducted by an Optometrist in the practice who did not involve in this study. The patient file was labelled in number to protect the personal data information. The demographic data including age, ethnicity, and gender were collected. The spherical equivalent refractive error (SER) data on each eye for each patient was collected and SER was calculated based on Holladay et al., (2021) report. The data were analysed utilizing IBM®SPSS® Version 26.0. Descriptive analyses were calculated on all patients' demographic data while repeated measure analysis of variance (ANOVA) was used to compare the SER on right (RE) and SER on left eyes (LE) from 2018 until 2021 respectively. The p-value less than 0.05 is considered significant finding.

RESULTS

As described in Table 1, mean of age for all 15 patients were 33.07 ± 1.79 years with the highest frequency recorded at the age of 33 and 35 years (26.7% each). Female recorded the highest percentage for gender (66.7% of total patients), while all patients recorded from 2018 until 2021 were Malay (100%).

Table 1 Demographic data

Description N = 15	Mean (SD)	Frequency	Percentage (%)
Age (years)	33.07 (1.79)		
30		2	13.3
31		2	13.3
32		0	0
33		4	26.7
34		3	20.0
35		4	26.7
Gender			
Male		5	33.3
Female		10	66.7
Ethnic			
Malay		15	100
Chinese		0	0
Indian		0	0
Others		0	0

Table 2 Comparison of SER on the right eye (RE) from 2018 to 2021

SER on RE N= 15	Mean (SD)	*p*-value
SE RE 2018	-2.92 (1.36)	< 0.001**
SE RE 2019	-3.00 (1.36)	
SE RE 2020	-3.50 (1.40)	
SE RE 2021	-3.68 (1.32)	

*SD: standard deviation

**$p < 0.05$

Repeated measure analysis of variance (ANOVA) shows that all the p-values for the SER of right and left eyes were less than 0.05, indicating that there was statistically significant increase in the SER mean from 2018 to 2021. Table 2 and 3 demonstrates the significance level and the mean of SER for the RE and LE from 2018 until 2021.

Table 3 Comparison of spherical equivalent on the left eye (LE) from 2018 to 2021

SER on LE N = 15	Mean (SD)	*p*-value
SE LE 2018	-2.92 (1.25)	
SE LE 2019	-2.98 (1.25)	0.004**
SE LE 2020	-3.42 (1.31)	
SE LE 2021	-3.58 (1.29)	

*SD: standard deviation
**$p < 0.05$

DISCUSSION

Several studies have shown the possible correlation between near work and the progression of myopia, especially in young individuals which are children and teenagers. Myopia is closely related to the Asian community. The developed countries of East Asia are aware of the current myopia epidemic (Mak et. al., 2018). Certain theories propose that extended periods of near work might cause eye strain and exhaustion. Consequently, these factors could induce the elongation of the eyeball, which potentially contributes to the development and increment of myopia. The relationship between near work and hyperopic defocus is thought to be explained by a poor accommodative response in juvenile myopia (Huang et al., 2015)

In present study, the mean SER of patients on each eye respectively from 2018 to 2021 were compared. The findings showed that the SER of the myopic patients did show significant increment annually. The changes of SER on each eye in 2019, compared to the baseline data in 2018, was almost significant whereby the range of increment is about -0.06 to -0.08D. However, the changes of SER on each eye in 2020 was significant, whereby there was an increment about -0.50D compared in 2019. In contrast, the rate of changes in 2020 did not materialize in 2021. The changes recorded were about -0.16 to -0.18D. The refractive error changes of myopia in adults in the present study could be influenced by several factors which may include heredity, environmental factors such as excessive or less hours spent in outdoor activities, occupational considerations, and lifestyle choices. Increased dioptre hours of near work may lead to an increase in the prevalence of myopia since near work activities were linked to myopia (Huang et al., 2015). Nevertheless, since the onset of myopia among patients were categorized as late onset juvenile myopia, the significant increment of refractive error recorded in 2020 might be due to the situation induced by COVID-19 pandemic that changes the way of life at that time.

COVID-19 pandemic has had a huge impact on people's daily or routine activities, particularly their screen-time routines. To stop COVID-19 from spreading across the

country in Malaysia, the Movement Control Order (MCO) was put into effect on 18th March 2020 and remained in effect through 28th April 2020 (Elengoe, 2020). People turned to digital entertainment for relaxation during the pandemic as there were few opportunities for outdoor activities and social meetings which led to increased usage of streaming services for movies, TV shows, and online games. Increasing the amount of time spent outside considerably slowed the advancement of myopia, according to three studies that investigated the relationship between outside time and myopia (Sherwin et. al., 2012). Social media, social networking sites and messaging applications become even more important for maintaining contact with friends and family during times of lockdown and social distancing and to maintain social interactions, people spend more time on websites and social apps such as Facebook, Instagram, Twitter, WhatsApp, and others. Screen time plays a crucial function in bridging the communication gap between teens and their wellbeing to aid in their adjustment to these new norms (Amran & Jamaluddin, 2022).

Numerous people had to adjust to new ways of working, learning, and socialising from home as limitations on mobility and social gatherings were put in place to stop the virus from spreading. Most adults had to work from home and some of them lost their jobs. Increased time spent indoors and a shift to remote activities, screen time has significantly increased globally. Virtual meetings and video conferencing through online platforms by using gadgets such as laptops, computers and smartphones became the new norm as offices were closed and workers working from home. Communication with coworkers, clients, and business partners increased on online platforms.

CONCLUSION

Results of this study showed that myopia refractive error changes do not only occurs to children and teenagers, but it also may occur among adults as environmental factors which are excessive near work and less outdoor activities also could contribute to the increment of myopia SER especially in COVID-19 and movement control order era. Myopia refractive error changes in adults is extremely important, just as it is in children. The refractive error changes are frequently linked to younger age groups, however its effects on adults shouldn't be disregarded. Adults spend most of their lives working and participating in many activities; thus, the refractive error changes of myopia can have a significant impact on their quality of life. Therefore, with this finding, it is hoped that it can assist for further thorough research and attention to myopia refractive error changes in adults to create efficient preventive and management plans as well as measures for enhancing this population's visual health and general quality of life.

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