



RELATIONSHIP OF MYOPIA DEGREE WITH RETINAL DETACHMENT INCIDENCE AT DIPONEGORO NATIONAL HOSPITAL

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ABSTRACT

Background: Myopia is one of the visual disorders that has a high prevalence in the world. Based on the severity degree, myopia is divided into three criteria, namely mild, moderate and severe. Severe-degree myopia patients are more likely to suffer from certain eye diseases, especially those associated with the retina, such as retinal detachment. **Objective:** To analyze the relationship between the degree of myopia and the incidence of retinal detachment. **Methods:** This research is an observational analytical with a cross-sectional approach. The research data was obtained using consecutive sampling from the medical records of myopia patients in Diponegoro National Hospital during 2015-2020. The research subjects used in this research were 70 patients who fulfilled the inclusion and not the exclusion criteria. The data were analyzed using Chi Square test. **Results:** The prevalence of retinal detachment is dominated by the age group of 51-60 years old (18.6%), male (35.7%) and a severe degree of myopia (34.3%). The results of the Chi Square test show that there is a significant relationship between the severity degree of myopia and the incidence of retinal detachment. **Conclusion:** There is a significant relationship between the degree of myopia and the incidence of retinal detachment.

Keywords: *Myopia, Degree of Myopia, Retinal Detachment*

INTRODUCTION

Myopia is a condition where the light that enters the eye is focused in front of the retina, which makes far objects appear blurry. Myopia is one of the eye diseases with a high prevalence in the world. This disorder is found in 25% of the population in America, 30-40% in Europe, 10-20% in Africa, and a relatively high prevalence of 70-90% in Asia.¹ In Indonesia, the prevalence reaches 22.1%.² Based on its severity degree, myopia is divided into three criteria, namely mild, moderate, and severe.³ Severe-degree myopia patients are more likely to suffer from certain eye diseases, especially those associated with the retina, such as retinal detachment.⁴

Retinal detachment is the detachment of the optical neural layer inside the eyeball from the layer below or the Retinal Pigment Epithelium (RPE) layer with subretinal fluid accumulation. This results in the inability of the retina to send light stimulation into the brain, which makes eyesight in the detachment area to be disrupted.^{4,5}

There are three categories of retinal detachment, which are rhegmatogenous, exudative, and tractional.

Rhegmatogenous retinal detachment is the most common one and is caused by fluid that flows from the vitreous chamber through the retinal rupture or into the potential chamber between the retinal

sensory layer and retinal pigment epithelium. The most common disorder that induces this category of retinal detachment is myopia. The increase of axial length in the myopic eye causes mechanical retinal distention and thinning which may risk retinal detachment to occur.^{6,7}

Retinal disorder prevalence in the world is 1 case in 10,000 population. In Indonesia, the prevalence itself reaches 0.13% and is the fourth most common cause of blindness after cataracts (0.78%), glaucoma (0.20%), refraction disorder (0.78%), and other causes (0.10%).⁸ Based on medical records from Diponegoro National Hospital, there are 92 cases of retinal detachment in 2020, 190 cases in 2019, 132 cases in 2018, and 35 cases in 2017. Retinal detachment usually occurs in ages 40-70 years old. The prevalence increases in several cases, such as severe myopia, trauma, and aphaxia/pseudophakia. In retinal detachment patients, 55% has myopia, 20-30% has lattice degeneration, 10-20% has trauma, and 30-40% has aphaxia/pseudophakia. Retinal detachment patients in Diponegoro National Hospital are quite many. This research is undertaken to determine the relationship between myopia severity degree and the incidence of retinal detachment.



METHOD

This research was done during June - July 2021 in Diponegoro National Hospital. Analytical observational study with cross-sectional approach was used as the research method. This research aims to understand the relationship of myopia degree with the incidence of retinal detachment.

Samples that were used in this research are 70 myopia patients that fulfill the inclusion criteria but not the exclusion criteria. The inclusion criteria in this research are myopia patients with the age of 6-70 years old, while the exclusion criteria are patients with cataract, glaucoma, diabetic retinopathy with traction retinal detachment, history of trauma, and prior intraocular/laser operation. Consecutive sampling of medical records from myopia patients that fulfill inclusion criteria but not the exclusion criteria was used to choose samples. Myopia degree is the independent variable in this research and retinal detachment is the dependent variable.

Data that were obtained were analyzed through univariate analysis. It is then followed by bivariate analysis to find the relationship between 2 variables. The data were analyzed using Chi Square test.

RESULTS

Descriptive analysis was used to understand the frequency and data distribution of each variable. Characteristics of research subjects are listed in table 1.

Table 1. Characteristics of myopia patients.

Variable	f	%
Age		
1-10 years	1	1,4
11-20 years	20	28,6
21-30 years	8	11,4
31-40 years	9	12,9
41-50 years	15	21,4
51-60 years	13	18,6
61-70 years	4	5,7
Sex		
Male	32	45,7
Female	38	54,3
Myopia Degree		
Mild	23	32,9
Moderate	18	25,7
Severe	29	41,4
Rhegmatogenous Retinal Detachment Occurance		
Yes	40	57,1
No	30	42,9

Table 1 describes the characteristics of research subjects with the number of 70 patients. In this research, age distribution of myopia patients are mostly found on 11-20 years old with 20 patients (28.6%). The youngest and oldest patients of myopia are 9 and 66 years old respectively. It is also found that myopia incidence are higher in females with 38 patients (54.3%), while males are composed of 32 patients (45.7%). The distribution of myopia degree is mostly found on the severe degree with 29 patients (41.4%).

From the table above, rhegmatogenous retinal detachment incidence can also be observed. This particular type of retinal detachment is found on 40 patients (57.1%), while the other 30 patients (42.9%) do not have rhegmatogenous retinal detachment.

Table 2. Characteristic of rhegmatogenous retinal detachment incidence severity

Variable	Rhegmatogenous Retinal Detachment Incidence			
	Yes		No	
	f	%	f	%
Age				
1-10 years	1	1,4	0	0
11-20 years	2	2,9	18	25,7
21-30 years	4	5,7	4	5,7
31-40 years	4	5,7	5	7,1
41-50 years	12	17,1	3	4,3
51-60 years	13	18,6	0	0
61-70 years	4	5,7	0	0
Sex				
Male	25	35,7	7	10
Female	15	21,4	23	32,9
Myopia Degree				
Mild	5	7,1	18	25,7
Moderate	11	15,7	7	10,0
Severe	24	60	5	16,7

From 40 myopia patients with rhegmatogenous retinal detachment, occurrence in males is found to be more common, comprising 25 patients (35.7%). Myopia patients with rhegmatogenous retinal detachment are more common in the age group of 51-60 years old, consisting of 13 patients (18.6%) and based on myopia degree, retinal detachment incidence are more common in severe myopia, with the number of 24 out of 29 patients (34.3%). In mild myopia, retinal detachment is found in 5 out of 23 patients (7.1%), while in moderate myopia, retinal detachment is found in 11 out of 18 (15.7%).



Table 3. Relationship of Myopia Degree with Retinal Detachment Incidence

Myopia Degree	Rhegmatogenous Retinal Detachment Incidence				p
	Yes		No		
	f	%	f	%	
Mild	5	7,1	18	25,7	<0,001 [¥]
Moderate	11	15,7	7	10,0	
Severe	24	34,3	5	7,1	
Total	40	57,1	30	42,9	

Noted: * Significant ($p > 0,05$); [¥] Chi Square Test

Table 3 shows Chi Square test results on the relationship between myopia degree and retinal detachment incidence with a result of $p < 0.001$. There is a significant relationship between myopia degree and retinal detachment incidence.

DISCUSSION

In this study, distribution of myopia patients is found higher in the age group of 11- 20 years old with 20 patients (28.6%). This is in line with Hartanto et al. (2010) study, with the result being 11-20 years old as well.⁹ Myopia degree incidence increases with age and can be progressive due to the eyeball experiencing lengthening and changing of eyeball component.¹⁰

Distribution of myopia patients are more common in females with 38 patients (54.3%). This follows the result given in Lestari et al. (2020) study which stated that myopia incidence in females are higher than males. This is due to less outdoor activities than male or lifestyles and environments that are less exposed to sunlight. Sunlight itself is needed to reduce accommodation power and dopamine release by the retina to decrease eye elongation, which in turn reduces the risk of myopia.^{3,11}

Myopia degree distribution in this research that is most common is severe degree with 29 patients (41.4%), followed by mild and moderate with 23 patients (32.9%) and 18 patients (25.7%) in that order. This study is different from the kinayoh et al (2017) which get the most distribution of myopia degrees are mild degrees (48.5%) followed by moderate degrees (31.8%) and severe degrees (19.7%).⁷ This is because Diponegoro National Hospital although type C Hospital but is a referral hospital so this makes many patients of severe myopia at Diponegoro National Hospital.

Rhegmatogenous retinal detachment is found in 40 myopia patients (57.1%). This is consistent with the theory that myopia is the biggest risk factor for rhegmatogenous retinal detachment.¹² Rhegmatogenous retinal detachment are found more common in males with 25 patients (35.7%), while females only consists of 15 patients (21.4%). This is in line with Budhiastra et al. (2016) study which stated that rhegmatogenous retinal detachment patients are mostly males (71.42%) compared to females (28.57%).⁴ Wang et al. stated that the axial length of eyeball in males is longer and there is a difference in basal vitreoretinal adhesion, which contributes to a higher incidence of rhegmatogenous retinal detachment.¹³

Rhegmatogenous retinal detachment in this research is found to be more common in the age group of 51-60 years old with 13 patients (18.6%), followed by 41-50 years old with 12 patients (17.1%). This is consistent with the findings of Lihteh et al. (2019) which stated that rhegmatogenous retinal detachment is most commonly found in 40-70 years old age group.¹⁴ Leeuwen et al (2021) also stated that high levels of rhegmatogenous retinal detachment are found in 55-59 years old.¹⁵ The older someone is, there is a higher prevalence of vitreous degeneration. The occurrence of Posterior Vitreous Detachment (PVD) with peripheral retinal degeneration will increase the chances of rhegmatogenous retinal detachment.⁴

In this study, retinal detachment incidences are found mostly in severe myopia with 24 out of 29 patients (34.4%). This follows the theory where patients with severe myopia are more susceptible to several eye disorders, especially retinal disorders such as retinal detachment.¹⁶ The findings in this study is also in line with Budhiastra et al. (2016) study which states that severe myopia is the most common case that causes rhegmatogenous retinal detachment.⁴

Based on Chi Square test that had been conducted, it is found that there is a significant relationship between myopia degree and retinal detachment incidence. This research proves that the higher the degree of myopia is suffered by the patients, the more numbers of rhegmatogenous retinal detachment can be found. This is in line with Han et al. (2020) study which stated that there is a significant relationship between myopia and retinal



detachment, where the retinal detachment incidence risk increases linearly in severe myopia.¹⁷

Research that was conducted by Bhardwaj et al. (2013) stated that myopic eye has a longer axial length than normal eyeball.¹⁸ This may be caused by genetic and growth factors. The increase in axial length of the eyeball can cause retinal distention and thinning.⁷

Other research conducted by Othman et al. (2012) stated that myopia degree is related to peripheral retinal thickness. The higher the myopia degree, the more peripheral retinal thickness decreases.¹⁹ Based on a study done by Kwan et al. (2013), peripheral retinal thickness decreases up to 7% in severe myopia when compared to non-myopic eye. The decrease in thickness occurs to counteract the forced pull that happens in all parts of retina so that central retinal thickness may be maintained. Besides that, optical fibers in peripheral retina are distended easier due to existing traction which leads to peripheral retina to be thinner than central retina.^{20,21}

All parts of posterior eye, besides being influenced by the retina, can also be influenced by the increase in axial eyeball length that will lead to changes in the eyeball, such as sclera and choroid distention, retinal thinning, and vitreous liquefaction. Choroid distention in myopia patients can induces a decrease in peripheral retinal thickness and blood supply. Also, distention and thinning of retinal pigment epithelium can also happen due to choroid distention that in the end will lead to retinal detachment.²²

This study has limitations because data on the axial length of the eyeball was not obtained and it used secondary data from medical records, so that other data such as history of trauma as a confounding variable were not obtained completely from medical records.

Future researches are required to understand more about axial length of the eyeball and method of data collection may also use direct patient interview to collect information that are needed such as trauma history as a confounding variable.

CONCLUSION

There is a significant relationship between the degree of myopia and the incidence of retinal detachment.

ETHICAL APPROVAL

This study received Ethical Clearance from the Health Research Ethics Commission, Faculty of Medicine, Diponegoro University with ethical clearance number No. 174/EC/KEPK/FK-UNDIP/V/2021.

CONFLICTS OF INTEREST

There are no conflict of interest in this study.

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