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Relationship between the Increase in the Body Mass Index with Axial Length and Anterior Chamber Depth in Patients with Refractive Errors at H Adam Malik Hospital Medan

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Abstract: ***Objective:*** ***To determine the relationship between the increase body mass index with Axial Length and Anterior Chamber Depth in patients with refractive errors.*** ***Method:*** ***This is an observational cross-sectional study. A total sample of 96 subjects were included. 42 people with Excess Body Mass Index and 54 people with Normal Body Mass Index. Each patient was measured height, weight, vision with the Snellen Chart and corrected by Trial Lens. The axial length and anterior chamber depth measured by Biometry A-scan AL-100.*** ***Results:*** ***The number of patients with Normal Body Mass Index experiencing Emmetropia were 60%, Myopia were 57.1%, Astigmatism Myopia ODS were 50%, and those with Astigmatism Myopia Compound ODS were 50%. The number of patients with Excess Body Mass Index experiencing Emmetropia were 40%, Myopia ODS were 42.9%, Myopia ODS were 50%, Myopia OS were 100%, and Astigmatism Myopia Myopia Compound OD + OS were 50%.*** ***Conclusions:*** ***There is no relationship between the increasing of Body Mass Index with Axial Length and Anterior Chamber Depth in patients with refractive errors.***

Keywords: Axial Length, Anterior Chamber Depth, Body Mass Index

1. Introduction

Body mass index is a measure used to assess the proportionality ratio between height and weight. Height and weight have been known previously associated with several conditions anatomy of the eye. Height is often associated with the condition of the axial length, and weight gain often associated with the condition of the anterior chamber depth.[1,2,3]

Axial Length and Anterior Chamber Depth plays a role in determining the strength of eye accommodation. When people suffer from refractive errors, it can cause disruption to activities, both in the process of learning and social interaction that can affect productivity, academic activity, sosial relationship.[4,5]

Obesity has a relationship with intraocular pressure and Anterior Chamber Depth, where it is stated by Alime, Feyzahan, Emine, and Mustafa in 2015 in the Evaluation of Anterior Segment Parameters in Obesity.[7] Roy A et al conclude there were association between anterior chamber depth, vitreous chamber depth, and height. Also found a relationship between axial length, vitreous chamber depth and age. Subjects with a Excess Body Mass Index tends to be hyperopia.[6]

Rodiah R also conclude that there are differences in Axial Length at each increment 1 dioptri.[8] Seang-Mei Saw et al conclude that there is a relationship between height with the length of the eyeball, the depth of the vitreous, the corneal surface is flat and straight in myopia, children who are overweight tend to have hyperopia and has shallow vitreous chamber depth.[1]

Wong et al concluded that the height independently linked to ocular dimensions, but has no effect on the power of refraction. Taller people tend to have a deeper anterior chamber depth, thinner lens and flatten corneal surface. There is some correlation between weight with refractive errors but found unclear relationship to the biometric components that affect that conditions.[9] The eye's ability to see and accomodate influenced by several factors including the Axial Length and Anterior Chamber Depth and the conditions of both is affected by height and weight.[1,6,7,9]

2. Method

This is an observational cross-sectional study. The data was retrieve from patients at Policlinic Refraction at Adam Malik General Hospital Medan. The inclusion criteria of this study was Refraction Patients who visited the clinic of Ophthalmology H Adam Malik General Hospital in Medan. Exclusion criteria of this study are patients aged <20 years, patients with abnormalities of the iris, patients with deformities of the pupil, patients with systemic disorders, patients with retinal disorders, patients with cataract and lens aberration, patients with corneal abnormalities, patients with a history of eye ball surgery, patients with inflammation of the orbit, patients with a tumors history, and patients with abnormalities of the face.

The data sample consists of name, age, height, weight, VOD, VOS, BCVA ODS, ACD ODS, AL ODS and BMI. Each patient was measured height, weight, vision with the Snellen Chart and corrected by Trial Lens. Then examined keratometri with Righton Speedy – K Autorefractometer, and measured the axial length (AL) and anterior chamber depth (ACD) by using A-scan biometry AL-100. The data were

processed using the Correlation Kolgorov Smirnov to sample. All statistical tests using p <0.05 as the limit of significance with SPSS software.

3. Result

This was an observational cross-sectional study that aims to determine the relationship between the increasing of body mass index with axial length and anterior chamber depth in patients with refractive errors by taking data on Policlinic Refraction patients at Adam Malik Hospital in Medan. Patients with excess body mass index as many as 42 people and patients with a normal body mass index as many as 56 people.

Table 5.1: Correlation between Body Mass Index with *Axial Length ODS (AL ODS)* and *Anterior Chamber Depth ODS (ACD ODS)*

BMI Correlation with	N	R	P
AL OD	98	0,140	0,168
AL OS	98	0,119	0,243
ACD OD	98	0,078	0,447
ACD OS	98	-0,012	0,910

From Table V.1 shows there is no association between body mass index with Axial Length ODS (AL ODS) and ODS Anterior Chamber Depth (ACD ODS)

Table 5.2: Axial Length ODS (ODS) and Anterior Chamber Depth ODS (ACD ODS) differential tests between the Excess Body Mass Index and Normal Body Mass Index

	Body Mass Index				
	Normal		Excess		P
	N	XI SD	N	XI SD	
AL OD	56	23,55±1,34	42	23,70±1,24	0,581
AL OS	56	23,67±125	42	23,76±1,16	0,730
ACD OD	56	3,02±0,36	42	3,03±0,39	0,900
ACD OS	56	3,16±0,29	42	3,09±0,37	0,285

Table V.2 showed that there was no difference in the average Axial Length and Anterior Chamber Depth between excess body mass index with normal body mass index.

Table 5.3: Refractive error distribution in Excess Body Mass Index and Normal Body Mass Index

Refractive Error	Body Mass Index						
	Normal	Excess		Total		P	
	N	%	n	%	N	%	
Emmetropia	24	60,0	16	40,0	40	100	1.00
Myopia ODS	28	57,1	21	42,9	49	100	
Astigmatism Myopia ODS	3	50	3	50	6	100	
Myopia OS	0	0	1	100	1	100	
Astigmatism Myopia Compund OD + Myopia OS	1	50	1	50	2	100	
Total	56	57,1	42	42,9	98	100	

Table V.3 showed no difference in refractive error between excess body mass index and normal body mass index. The Kolgorov Smirnov statistic to sample showed p> 0.05, means there is no difference in the distribution of refractive errors between normal body mass index and excess body mass index.

4. Discussion

In this study, 98 patients were examined where patients with Normal Body Mass Index were 56 people and patients with Excess Body Mass Index were 42 people. This study found no association between Body Mass Index with Axial Length ODS (AL ODS) and Anterior Chamber Depth ODS (ACD ODS). This is in line with research conducted by Ojaimi et al that found no correlation between anthropometric parameters with the capability of refraction, axial length and corneal radius ratio. Fahmi RM also concluded that the Body Mass Index did not have a relationship with ocular parameters. In a previous study conducted by the Alime, Feyzahan, Emine, and Mustafa concluded that obesity has a relationship with intraocular pressure and Anterior Chamber Depth. Roy A et al also concluded that there is an association between anterior chamber depth, vitreous chamber depth, and height. Also found a relationship between axial length, vitreous depth and age. Subjects with Excess Body Mass Index tends to have hyperopia.[1,9,10,13,14]

This study also did not found any difference in the average of Axial Length and Anterior Chamber Depth among patients with Excess Body Mass Index with Normal Body Mass Index, where it is in line with research conducted by Lee JH which concluded that no association between Axial Length , height with refractive errors. SYL Chua et al also stated that the Body Mass Index is not related to eye measurement results, and obesity does not affect the Axial Length, Anterior Chamber Depth or Myopia. Where on previous research conducted by Wong et al stated that the height independently linked to ocular dimensions. Taller people tend to have deeper anterior chamber depth, thinner lens and flatten corneal surface. Seang-Mei Saw, et al also concluded that there is a relationship between height with the length of the eyeball, the depth of the vitreous. The corneal surface is flat and straight in eye with myopia, children who overweight tend to have hyperopia and has a shallow vitreous chamber depth.[1,9,13,14]

This study also showed that body mass index was not associated with refractive errors. Where this is in line with research conducted by Bergman et al stated that the Body Mass Index is not related to visual acuity. Ernest O. - Nwoke, M. O. Ozor, U. Akpamu, M. O. Oyakhire also stated that Obesity was not associated with visual acuity. Iyamu E, Iyamu JE, Oghovwerha L also stated that there was no significant association between anthropometry and SEQ Refractive Error. Where on previous research conducted by Wong et al found an association between weight with refractive errors but found unclear relationship to the biometric components that affect it.[3,9,10,15] The results of this study indicate that there is no relationship between the increasing of Body Mass Index with Axial Length and Anterior Chamber Depth in patients with refractive errors.

5. Conclusion

The number of patients with Normal Body Mass Index experiencing Emmetropia were 24 people (60%), Myopia were 28 people (57.1%), Astigmatism Myopia ODS were 3 people (50%), and those with Astigmatism Myopia Compound OD + Myopia OS as much as 1% (50%). The number of patients with a Excess Body Mass Index experiencing Emmetropia were 16 people (40%), Myopia ODS were 21 people (42.9%), Myopia ODS were 3 people (50%), Myopia OS as much as 1 (100%), and experiencing Astigmatism Myopia Compund OD + Myopia OS by 1 person (50%).

There is no relationship between the increasing of Body Mass Index with Axial Length and Anterior Chamber Depth in patients with refractive errors, which the refractive disorders may be affected by other circumstances such as macrovascular and microvascular anatomy of the eye, near distance, outdoor activities, and usage of multimedia equipment.

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