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Moderating Effect of Comorbidities on Intrinsic and Extrinsic Factors on the Incidence of Senile Cataract at Muhammad Sani Hospital, Riau Islands Province Using Partial Least Square

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Abstract:
Background*: Cataract is a clouding of the lens of the eye that causes visual disturbances and is the main cause of blindness. The report on the results of the Basic Health Research shows that the prevalence of cataract blindness in the Riau Islands Province is 1.4%, exceeding the WHO blindness prevalence limit of 0.5%. One type of cataract with the largest number of sufferers is senile cataract. Based on the results of inpatient visits in 2017 at the Muhammad Sani Hospital, Riau Islands, senile cataract was the case with the highest visits. Given the high incidence of senile cataract, preventive measures are needed to control the factors that cause senile cataract.*
Materials and Methods*: This study aims to determine the combination of factors causing senile cataract with the Partial Least Square method. Factors that are thought to have an effect are intrinsic factor, extrinsic factor, history factor of comorbidities. gender, age, education, occupation related to ultraviolet light exposure, history of diabetes mellitus, hypertension, and eye trauma.*
Results*: The results of the study using the partial least squares (PLS) approach showed that the moderating history of comorbidities on intrinsic and extrinsic factors was a fit model based on the values of R^2, Q^2.*
Conclusion: *Age as a dominant indicator in intrinsic factors, while occupational indicators related to exposure to ultraviolet light as a dominant indicator in extrinsic factors, and then history of diabetes mellitus, and history of hypertension as a dominant indicator in history of comorbidities. History of comorbidities with indicators of diabetes mellitus and hypertension are the dominant factors in influencing senile cataract status. History of comorbidities as a moderating variable intrinsic factor has a greater influence on senile cataract status than extrinsic factors.*
Key Word*: Senile Cataract; Muhammad Sani Hospital Riau Island; Moderating; Partial Least Square****.***

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I. Introduction

The eye is one of the senses that is important for humans, through the human eye absorbing visual information that is used to carry out various activities. If there is a severe disturbance that occurs in vision, it will result in blindness in a person (Kemenkes RI, 2014) [1]. The prevalence of blindness in Indonesia in 2013 was 0.9% with a population of more than 900,000 people with blindness (Riskesdas, 2013) [2]. This is a health problem as well as a social problem, because this figure exceeds the prevalence limit of blindness according to WHO standards of 0.5%. Cataract is the main cause of blindness in Indonesia with a prevalence of cataract blindness of 0.78%. Cataract is a degenerative disease where the crystalline lens of the eyeball that should be clear and clear turns cloudy so that it interferes with vision and will eventually cause blindness (Ilyas, 2001) [3]. One type of cataract that most people suffer from is senile cataract. Senile cataract is a disease of the eye caused by the aging process or age factor so that the lens of the eye becomes hard and cloudy. Senile cataract is thought to be due to a multifactorial process, consisting of intrinsic and extrinsic factors. Intrinsic factors, such as: age and gender, while extrinsic factors or external influences, such as: ultraviolet radiation, increased blood sugar levels or diabetes mellitus, hypertension, and blunt object trauma to the eyeball (James, et. al., 2006) [4].

Quiroga, et. al. (2010) [5], conducted a study on the characteristics of the corneal endothelium and pseudoexfoliation syndrome in patients with senile cataract. Haspiani, (2017) [6], the characteristics of cataract patients based on the highest proportion are in the age group > 65 years (24.65%), female gender (55.45%), without a history of Diabetes Mellitus (65.35%), left eye side (52.48%), poor preoperative vision (51.49%), good postoperative vision (44.55%), immature cataract stage (83.17%) and Phacoemulsification surgery (90.10%). Patients aged > 65 years with cataracts reaching the immature stage were 84 people (83.17%), while the number of cataract patients who did not have a history of DM had the most postoperative vision in the good category as many as 29 people (43.94%) also in cataract patients with a history of DM had the most postoperative vision with good category as many as 16 people (45.71%). Pujiyanto, (2004) [7], factors that influence senile cataract are intrinsic and extrinsic factors. Intrinsic factors include age, gender, history of Diabetes Mellitus, nutritional status, and chronic diarrhea, while extrinsic factors include smoking, consumption of cataractogenic drugs, alcohol consumption, and work exposed to ultraviolet light. Rim et. al., (2014) [8], risk factors for cataract subtypes identified from the Korea National Health and Nutrition Examination Survey 2008–2010 using multivariate logistic regression stated that improved control of blood pressure, blood, glucose, and cholesterol can help reduce the incidence of cataracts.

Meanwhile, in the Riau Islands Province, the prevalence of cataract blindness was 1.4% in 2013, where this figure is more than the prevalence of cataract blindness in Indonesia and exceeds the prevalence limit of blindness by WHO (Riskesdas, 2013) [2]. Karimun Regency as one of the regencies in the Riau Islands Province recorded the highest cases of eye blindness caused by cataracts with a prevalence of more than 50% of people over 55 years old and more than 70% of people over 70 years old suffering from cloudiness of the eye lens. This is in line with the results of inpatient visits at the Karimun Regency general hospital in 2017, where senile cataract cases were the most cases suffered by inpatients with 426 senile cataract cases out of 703 eye disease cases (RSUD Muhammad Sani, 2003) [5] [9].

The prevalence of cataract blindness in the Riau Islands Province was 1.4% exceeding the WHO blindness prevalence limit of 0.5% and senile cataract cases were the disease with the largest visits to inpatient services at Muhammad Sani Hospital in 2017 where there were 426 senile cataract cases from 703 total cases of eye disease were recorded at the Eye Disease Clinic at the Muhammad Sani Hospital. Because the factors that influence the incidence of senile cataract are latent variables, one of the methods that can be used is structural equation modeling (SEM) partial least squares (PLS) (Otok, et.al., 2018) [10]

Methods related to latent variables are SEM (Otok, et.al., 2018 [10]; Mulaik, 2009 [11]; Raykov & Marcoulides, 2006 [12]; Hair et.al., 2006 [13]; Bollen, 1989 [14]). Several studies related to SEM, namely Long, et. al. (2017) [15], conducted a study of pediatric cataracts using structural equations whose results provide new insights and clinical implications in pediatric cataracts. Yuki, et.al., (2015) [16], the Influence of Visual Function and Systemic Risk Factors on Falls and Injurious Falls in Glaucoma.

Covariance-based SEM is strongly influenced by parametric assumptions that must be met such as the distribution of data must be normal, multivariate, no outliers, nonsingular. An alternative to overcome these problems, a variant-based SEM was developed called partial least squares (PLS). This method does not require many assumptions, it can be used for confirmation and prediction. The weakness is that the distribution of unknown data results in researchers not being able to assess the significance of the prediction, except through the resampling method with bootstrap. The bootstrap method works through a resampling with replacement procedure by creating shadow data using information from the original data so that an accurate statistical estimator is obtained. PLS can also be used to confirm theories, besides that PLS can also be used for prediction purposes. PLS can simultaneously analyze the constructs formed with reflexive and formative indicators. This cannot be done by covariance-based SEM because it will become an unidentified model, because the indicator is reflexive, so changes in the value of an indicator are very difficult to determine changes in the value of the latent variable so that prediction is difficult to do, while PLS can use reflexive indicators as well as indicators. formative so that the latent variable is a linear combination of the indicators, then the predicted value of the latent variable can be easily obtained. PLS does not assume a certain distribution for parameter estimation, so parametric techniques to test the significance of parameters are not needed. The magnitude of the structural path coefficient stability of this estimate was evaluated using the t-test statistic obtained from the bootstrapping procedure (Chin, 1998) [17].

In this study, the indicators and variables that affect the status of senile cataracts in Muhammad Sani Hospital were studied theoretically using partial least squares, and as a moderating variable is the history of comorbidities.

II. Material And Methods

The data used in this study is secondary data obtained from the Eye Disease Specialist Clinic at the Muhammad Sani Hospital, Karimun Regency, Riau Islands Province. The data taken is inpatient data from

January to December 2017 which was obtained from the patient's medical record document with a total sample of 703 patients (Levy and Stanley, 1999) [18]

Based on the factors thought to have an effect on senile cataract, the researchers modified by selecting several risk factors for senile cataract, namely intrinsic factors (age, gender), extrinsic factors (last education, occupation or place of work), behavioral factors (smoking, alcohol consumption), and history of comorbidities (history of diabetes mellitus, history of hypertension and history of eye trauma) (Suiraoka, 2012; Gibney et., al., 2009) [19][20]. The conceptual framework for senile cataract status is presented as follows.

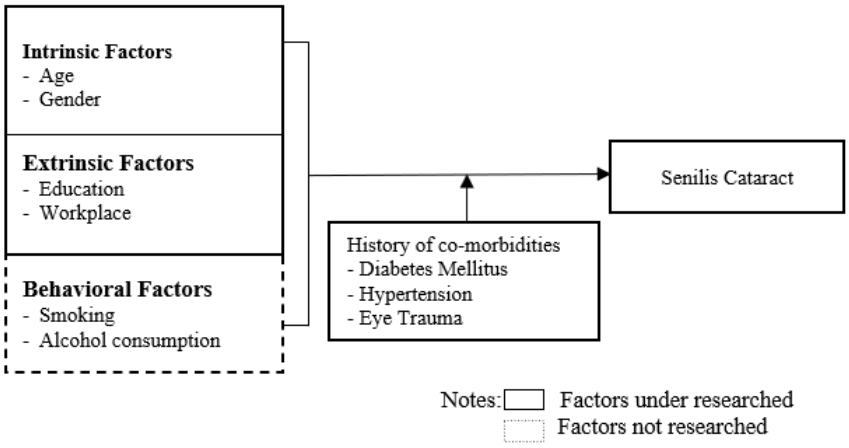

Figure 1.
Conceptual framework for senile cataract status after modification (Pujianto, (2004)[7], Arimbi, 2012 [21])

The variables used in this study refer to previous research conducted by (Aini, & Santik, 2018 [22]; Arimbi, 2012 [21]; Pujiyanto, 2004[7]), then the variables used in this study are as follows.

Table 1. Research Variables

Variables	Categorical	Scale
Cataract Senile Status (CS)	1 : Patients without senile cataract 2 : Patients with senile cataract	Nominal
Age	1 : ≤ 40 year 2 : > 40 year	Nominal
Gender	1 : Male 2 : Female	Nominal
Education	1 : Academy/College 2 : Senior High School 3 : Junior High School 4 : ≤ Primary School	Ordinal
Workplace	1 : Indoors/Room 2 : Outdoors	Nominal
Eye Trauma	1 : Never 2 : Once	Nominal
Hypertension	1 : Never 2 : Once	Nominal
Diabetes Mellitus	1 : Never 2 : Once	Nominal

Furthermore, the analysis was carried out using the PLS SEM method. The purpose of the estimation of PLS is to make the best score component of endogenous latent variables for predicting the relationship between latent variables and observation variables. In PLS latent variables can be the result of the reflection of the indicator (reflective indicator) and can also be formed as if the indicator affects the latent variable (formative indicator) (Otok et.al., 2018) [10].

Moderating SEM which is carried out using Partial Least Square (PLS) has the following analytical steps, and then the centroid scheme PLS modeling is carried out (Anekawati et. al., 2017) [23].
The parameter estimation process in PLS includes 3 things, namely:
a. Estimated weight (weight estimate) used to create a score for the latent variable.

b. Path estimation that connects latent variables and loading estimates between latent variables and their indicators.

c. Estimated mean (means) and location of parameters (regression constant value, intercept) for indicators and latent variables.

To assess the level of significance and obtain the stability of the estimation model of the measurement (outer model) and structural model (inner model) by looking for estimates of the standard error through resampling method with bootstrap. Bootstrap standard error of calculated by the standard deviation of B replication (Otok, et.al., 2018 [10]; Chin, 1998 [17]).

Inner model which describes the relationship between latent variables based on substantive theory. The method used to evaluate the measurement model (outer model) with reflexive indicators, namely the convergent validity of the indicators and composite reliability for the indicator block. The model has met the criteria of convergent validity if the loading factor value ≥ 0.50 or T-Statistic ≥ 1.96 and composite reliability if the value ≥ 0.50 (Chin and Newsted, 1998) [24].

The structural model (inner model) is evaluated by looking at the percentage of variance explained by looking at R2. For endogenous latent variables, look at the size of the Stone-Geisser Q^2 test (Stone, 1974 and Geisser, 1975 in Chin and Newsted, 1999) [24] and also see the magnitude of the coefficient of the structural path. The stability of the estimate was evaluated using the T-statistical test obtained through the standard error bootstrap procedure. To see the magnitude of the influence of changes in an indicator that is included or removed from the model is to look at the size of f^2 with the provisions of values equal to 0.02, 0.15 and 0.35 can be interpreted that the predictor of latent variables has a small, medium and large influence on structural level (Chin, 1998) [17].

The moderating model using the interaction method has two steps, first, it is proven that the moderating variable (History of Comorbidities) has a significant effect on the status of Senile Cataract (CS), while the second, if it is proven to have an effect, then the variable is suspected to be a moderating variable, and then modeling is carried out PLS by involving moderating variables and the interaction of moderating variables (History of Comorbidities) with moderated variables (Intrinsic and Extrinsic Factor) on the status of Senile Cataract (CS).

III. Result

Patient characteristics can be seen from the descriptive of each variable, namely age, gender, education, workplace, history of eye trauma, history of hypertension and history of diabetes mellitus. These variables were described based on senile cataract status (CS)

Table 2. Characteristics of Eye Disease Patients Based on Senile Cataract Status (CS)

Frequency (Total Percentage)		Senile Cataract Status		**Total**
		Patients without senile cataract	Patients with senile cataract	
Age	1 : ≤ 40 year	83 (11.8%)	6 (0.9%)	89 (12.7%)
	2 : > 40 year	194 (27.6%)	**420 (59.7%)**	614 (87.3%)
Gender	1 : Male	132 (18.8%)	**233 (33.1%)**	365 (51.9%)
	2 : Female	145 (20.6%)	193 (27.5%)	338 (48.1%)
Education	1 : Academy/College	51 (7.3%)	20 (2.8%)	71 (10.1%)
	2 : Senior High School	92 (13.1%)	65 (9.2%)	157 (22.3%)
	3 : Junior High School	41 (5.8%)	109 (15.5%)	150 (21.3%)
	4 : ≤ Primary School	93 (13.2%)	**232 (33.0%)**	325 (46.2%)
Workplace	1 : Indoors/Room	241 (34.3%)	**292 (42.5%)**	533 (75.8%)
	2 : Outdoors	36 (5.1%)	134 (19.1%)	170 (24.2%)
Eye Trauma	1 : Never	257 (36.6%)	**414 (58.9%)**	671 (95.4%)
	2 : Once	20 (2.8%)	12 (1.7%)	32 (4.6%)
Hypertension	1 : Never	243 (34.6%)	**227 (32.3%)**	470 (66.9%)
	2 : Once	34 (4.8%)	199 (28.3%)	233 (33.1%)
Diabetes Mellitus	1 : Never	225 (32.0%)	3 (0.4%)	228 (32.4%)
	2 : Once	52 (7.4%)	**423 (60.2%)**	475 (67.6%)

Table 2. provides information about the characteristics of eye disease patients based on senile cataract status. It can be seen that more than half of the total patients hospitalized at the Eye Disease Specialist Clinic at Muhammad Sani Hospital have senile cataracts. This can be seen from the percentage of senile cataract patients reaching 60.6%. Patients who suffer from senile cataract are mostly patients who are > 40 years old, male, last education elementary school, work in a building, have no history of eye trauma and hypertension, and have a history of diabetes mellitus.

The measurement model consists of a validity test and a reliability test. The detailed results are presented in the following table.

Table 3. Test the Validity and Reliability of Indicators on Latent Variables

Variables	Indicators	Validity				*Composite Reliability (C-R)*
		Original Sample Estimate	**Mean Of Subsamples**	**Standard Deviation**	**T-Statistic**	
Intrinsic Factors (FI)	Age	0.902	0.898	0.039	23.159	0.681
	Gender	0.508	0.505	0.098	5.191	
Extrinsic Factors (FE)	Education	0.146	0.150	0.054	2.706	0.550
	Workplace	0.976	0.957	0.051	19.091	
History of co-morbidities (CMB)	Diabetes Mellitus	0.946	0.946	0.009	107.774	0.684
	Eye Trauma	0.236	0.226	0.110	2.141	
	Hypertension	0.675	0.671	0.042	15.927	
Senilis Cataract (CS)	Senile Cataract	1.000	1.000	0.000		1.000

Table 3. shows that all indicators of each latent variable have a T-Statistic value greater than t-table = 1.96, then the indicator is significant. Furthermore, it also provides a Composite reliability value above its cut-off value of 0.5, so it can be said that all latent variables are reliable. The Intrinsic Factors (FI) indicator is reflective, it means that the intrinsic factor (FI) is measured by the indicators of age (0.902) and gender (0.508). Extrinsic factors are formed by indicators of education (0.146) and workplace (0.976). History of comorbidities was measured by indicators of history of diabetes mellitus (0.946), history of eye trauma (0.236), and history of hypertension (0.675).

The results of the original estimation and bootstrap estimation, B=500 moderating PLS (MPLS) stage-1 are presented in the following figure.

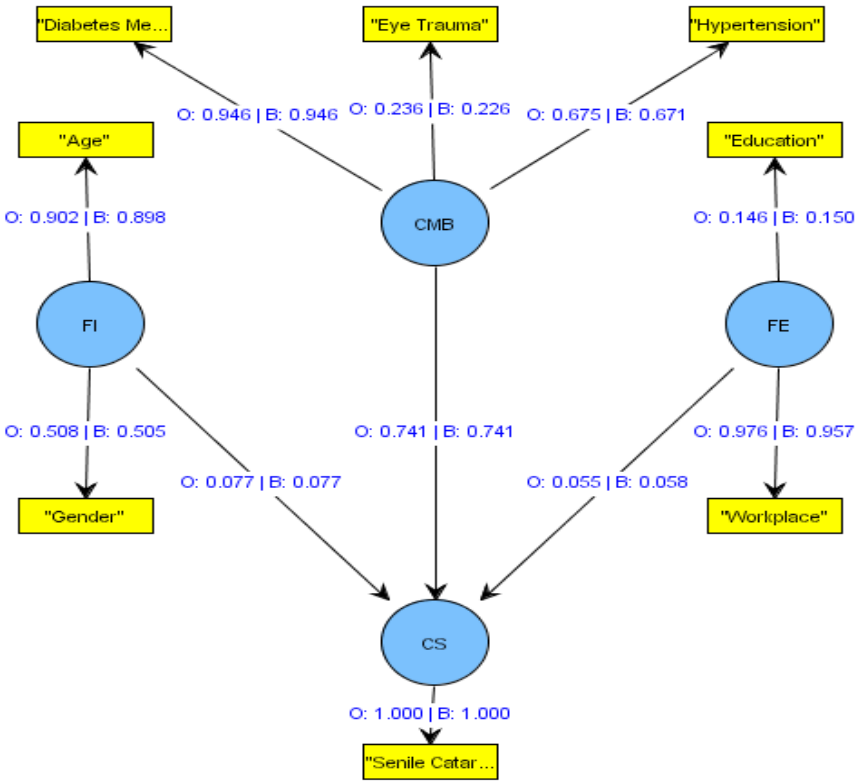

Figure 2.

Effect of Intrinsic Factors (FI), Extrinsic Factors (FE) on Senile Cataract (CS) and History of Comorbidities (CMB) as Moderating (MPLS) Stage - 1

The path coefficient tests in Figure 2 and the above equation in detail are presented in the following Table.

Table 4. Path Coefficient Testing Results with Bootstrapping Samples in the Senile Cataract (CS) Model with History of Comorbidities (CMB) as Moderating (MPLS) Stage – 1

Variables	original sample estimate	Boostrapping, B=100			Boostrapping, B=300			Boostrapping, B=500		
		mean of subsamples	Standard deviation	T-Statistic	mean of subsamples	Standard deviation	T-Statistic	mean of subsamples	Standard deviation	T-Statistic
Intrinsic Factors (FI)→ Senilis Cataract (CS)	0.077	0.077	0.053	1.452	0.074	0.035	2.187	0.077	0.029	2.665
Extrinsic Factors (FE)→ Senilis Cataract (CS)	0.055	0.060	0.071	0.781	0.062	0.051	1.090	0.058	0.027	2.038
History of Comorbiditie s (CMB)→ Senilis Cataract (CS)	0.741	0.742	0.067	11.044	0.743	0.046	16.085	0.741	0.040	18.740

Source: Data processed

Based on Table 4, it can be interpreted the research hypothesis of the direct effect of the moderating variable (History of Comorbidities (CMB)) on senile cataract (CS). (History of Comorbidities (CMB)) has a positive and significant effect on senile cataract (CS). This can be seen from the path coefficient which is positive at 0.143 with a T-Statistic value of 3,392 which is greater than t-table = 1.96. Thus (History of Comorbidities (CMB)) has a direct effect on senile cataract (CS) by 0.143, which means that every time there is an increase (History of Comorbidities (CMB)) it will increase senile cataract (CS) by 0.143. This shows that (History of Comorbidities (CMB)) is suspected as a moderating variable that strengthens the influence of Intrinsic Factors (FI) on senile cataract (CS). Moderating partial least square (MPLS) model in stage-2 which involves the interaction of the History of Comorbidities (CMB) variables with Intrinsic Factors (FI) with bootstrap to test the research hypothesis through t-test, and bootstrap stops if between the original estimate and the bootstrap estimate has a value which is approaching. The results of the original estimation and bootstrap estimation, B=500, in Stage 2 are presented in the following figure.

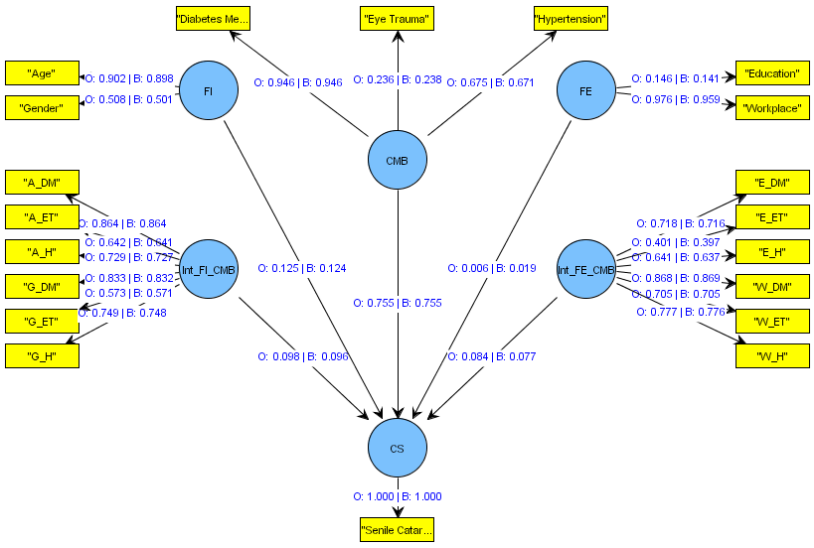

Figure 3.
Effect of Intrinsic Factors (FI), Extrinsic Factors (FE) on Senile Cataract (CS) and History of Comorbidities (CMB) as Moderating (MPLS) Stage – 2

The results of the complete model test can be seen from the R-Square value which describes the goodness-of-fit of a model. The recommended R-Square value is greater than zero. The R-square value is presented in Table 5 below.

Table 5. Goodness of Fit from R-Square Moderating Partial Least Square (MPLS) Stage – 2

Exogenous Variable → Endogenous Variables	*R-Square*
Intrinsic Factors (FI), Extrinsic Factors (FE), History of Comorbidities (CMB), Interaction of Intrinsic Factors (FI) and History of Comorbidities (CMB), Interaction of Extrinsic Factors (FI) and History of Comorbidities (CMB) → Senilis Cataract (CS)	0.644

Table 5 explains that the contribution or proportion of the variables Intrinsic Factors (FI), Extrinsic Factors (FE), History of Comorbidities (CMB), Interaction Intrinsic Factors (FI) and History of Comorbidities (CMB), Interaction Extrinsic Factors (FI) and History of Comorbidities (CMB) in explaining the variation around the Senilis Cataract (CS) variable of 0.644. The R-square value is greater than zero, meaning that this research model has met the required Goodness of Fit. The value of Q^2 = 0.644, it means that the moderating model of Comorbidities has high accuracy.

From the appropriate model, each path coefficient can be interpreted. The path coefficients are hypotheses in this study, which can be presented in the following structural equation:

SC = 0.125 FI + 0.006 FE + 0.755 CMB + 0.098 Int_FI_CMB + 0.084 Int_FE_CMB

where:

FI	: Intrinsic Factors
FE	: Extrinsic Factors
CMB	: History of Comorbidities
SC	: Senilis Cataract Status
Int_FI_CMB	: Interaction of Intrinsic Factors (FI) and History of Comorbidities (CMB)
Int_FE_CMB	: Interaction of Extrinsic Factors (FI) and History of Comorbidities (CMB)

The path coefficient tests in Figure 3 and the above equation in detail are presented in the following table.

Table 6. Path Coefficient Testing Results with Bootstrapping Samples in the Senilis Cataract (CS) Model with History of Comorbidities (CMB) as Moderating (MPLS) Stage – 2

Variables	original sample estimate	Boostrapping, B=100			Boostrapping, B=300			Boostrapping, B=500		
		mean of subsamples	Standard deviation	T-Statistic	mean of subsamples	Standard deviation	T-Statistic	mean of subsamples	Standard deviation	T-Statistic
Intrinsic Factors (FI)→ Senilis Cataract (CS)	0.125	0.118	0.063	1.957	0.117	0.063	1.992	0.124	0.043	2.876
Extrinsic Factors (FE)→ Senilis Cataract (CS)	0.006	0.034	0.115	0.054	0.029	0.091	0.069	0.019	0.083	0.075
History of Comorbidities (CMB)→ Senilis Cataract (CS)	0.755	0.760	0.127	5.922	0.755	0.098	7.680	0.755	0.100	7.569
Intrinsic of Factors (FI) and History of Comorbidities (CMB) (Int_X1_X3)→ Senilis Cataract (CS)	0.098	0.084	0.059	1.639	0.098	0.080	0.053	0.096	0.035	2.799
Extrinsic of Factors (FE) and History of Comorbidities (CMB) (Int_X2_X3)→ Senilis Cataract (CS)	0.084	0.054	0.173	0.484	0.084	0.057	0.139	0.077	0.124	0.673

Source: Data processed

Based on Table 6, each research hypothesis can be interpreted as follows:

- Intrinsic Factors (FI) has a positive and significant effect on senile cataract (CS). This can be seen from the path coefficient which is positive at 0.125 with a T-Statistic value of 2.876 which is greater than t-table = 1.96. Thus, Intrinsic Factors (FI) has a direct effect on Senile Cataract (CS) by 0.125, which means that every time there is an increase in Intrinsic Factors (FI) it will increase Senile Cataract (CS) by 0.125. This is in line with research (Sperduto, 2004 & Pujiyanto, 2004) [25][7]that the factors that influence the incidence of senile cataract are age, gender.
- Extrinsic Factors (FE) has no significant effect on senile cataract (CS). This can be seen from the path coefficient which is positive at 0.006 with a T-Statistic value of 0.075 which is smaller than t-table = 1.96. Thus Extrinsic Factors (FE) has no direct effect on Senile Cataract (CS), which means that every

increase and increase in Extrinsic Factors (FE) will not affect Senilis Cataract (CS) status of 0.075. This does not support research (Sperduto, 2004 & Pujiyanto, 2004) [25][7] that the factors that influence the incidence of senile cataracts are education, occupations associated with ultraviolet light.

- History of Comorbidities (CMB) has a positive and significant effect on senile cataract (CS). This can be seen from the path coefficient which is positive at 0.755 with a T-Statistic value of 7.569 which is greater than t-table = 1.96. Thus History of Comorbidities (CMB) has a direct effect on senile cataract (CS) by 0.755, which means that every time there is an increase in History of Comorbidities (CMB) it will increase senile cataract (CS) by 0.755. This supports research (Sperduto, 2004 & Pujiyanto, 2004) [25][7] that the factors that influence the incidence of senile cataract are a history of diseases such as diabetes mellitus, hypertension and eye trauma.
- Intrinsic Factors (FI) and History of Comorbidities (CMB) (Int_FI_CMB) have a positive and significant effect on senile cataract (CS). This can be seen from the path coefficient which is positive at 0.098 with a T-Statistic value of 2.799 which is greater than t-table = 1.96. Thus Intrinsic Factors (FI) and History of Comorbidities (CMB) (Int_FI_CMB) have a direct effect on Senile Cataract (CS) of 0.098, which means every time there is an increase in Intrinsic Factors (FI) and History of Comorbidities (CMB) (Int_FI_CMB) then will increase Senilis Cataract (CS) by 0.098. Alternatively, History of Comorbidities (CMB) moderated Intrinsic Factors (FI) which had a significant reinforcing effect on Senile Cataract (CS) of 0.098. This supports the statement (Suiraoka, 2021 & Gibney, et al., 2009) [19][20], that the factors of age, gender also affect diabetes mellitus and hypertension, which in turn also affects senile cataract (CS).
- Extrinsic Factors (FE) and History of Comorbidities (CMB) (Int_FE_CMB) had no significant effect on senile cataract (CS). This can be seen from the path coefficient which is positive at 0.084 with a T-Statistic value of 0.673 which is smaller than t-table = 1.96. Thus Extrinsic Factors (FE) and History of Comorbidities (CMB) (Int_FE_CMB) have no direct effect on Senile Cataract (CS), which means every time there is an increase and an increase in Extrinsic Factors (FE) and History of Comorbidities (CMB) (Int_FE_CMB) then it does not affect Senilis Cataract (CS). Alternatively, History of Comorbidities (CMB) does not moderate Extrinsic Factors (FE) against Senile Cataract (CS). This is not in accordance with research (Sperduto, 2004 & Pujiyanto, 2004) [25][7] and (Suiraoka, 2021 & Gibney, et al., 2009) [19][20] which state that the factors that influence the incidence of senile cataract are education, occupations associated with ultraviolet light and history of comorbidities.

IV. Conclusion

Based on the results of the analysis and discussion of senile cataract cases, the following conclusions are obtained.

1. Characteristics of patients with eye disease based on senile cataract status and history of diabetes mellitus. Patients who suffer from senile cataract are mostly patients who are > 40 years old, male, last education elementary school, work in a building, have no history of eye trauma and hypertension, and have a history of diabetes mellitus. Meanwhile, patients who have a history of diabetes mellitus are mostly patients who are > 40 years old, male, last education elementary school, work in a building, have no history of eye trauma and hypertension.
2. Age (0.902) is the dominant variable in intrinsic factor (FI), while in extrinsic factor the dominant indicator is workplace (0.976). History of comorbidities, the dominant indicators are history of diabetes mellitus (0.946) and history of hypertension (0.675).
3. The senile cataract status model with moderating intrinsic factor is a fit model based on the criteria of R square and Q square. Intrinsic Factors (FI) and History of Comorbidities (CMB) had a positive and significant effect on senile cataract (CS), while Extrinsic Factors (FE) had no significant effect on senile cataract (CS).
4. History of Comorbidities (CMB) moderated Intrinsic Factors (FI) which had a significant reinforcing effect on Senile Cataract (CS) by 0.098, while History of Comorbidities (CMB) did not moderate Extrinsic Factors (FE) on Senile Cataract (CS).

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