

DIABETES MELLITUS AND POSTERIOR SUBCAPSULAR TYPE OF SENILE CATARACT IN PRE-SURGERY PATIENTS AT PHC HOSPITAL SURABAYA

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ABSTRACT

Introduction: A cataract is an opacity of the lens, caused by many factors. Rapid Assessment of Avoidable Blindness (RAAB) that has been conducted in three provinces (NTB, Jawa Barat, dan Sulawesi Selatan) in 2013-2014 has come into a prediction of new cases of cataract blindness will increase 0.1% from the population or about 250.000 people a year. Metabolic disease such as Diabetes Mellitus (DM) is one of the well-known factors of cataract. Many studies, including Blue Mountains Eye Study and Beaver Dam Eye Study, have proved the increase of incidence and prevalence of posterior subcapsular cataract on diabetic patients. Posterior subcapsular cataract (PSC) means the lens opacity starts from the posterior part of the lens.

Aim: to study whether there is a correlation between DM and PSC in Surabaya or not.

Method: This research used the observational study with analytic design, and the method used in this research is cross-sectional. Spearman correlation was used in this research to test the correlation between variables.

Result: The population of this study is all pre-surgery senile cataract patients on PHC Hospital Surabaya. Twenty-two samples meet the inclusion and exclusion criteria. The analytic result shows that the correlation between diabetes and the posterior subcapsular senile cataract is insignificant ($p = -0.092$).

Conclusion: The exact pathogenesis of PSC remains unknown. It shows increased degenerative changes and the accumulation of extracellular material which can happen on diabetes patients. However, it has been noted to occur as a result of a gene mutation. That explained the insignificance result of this research and the different distribution of PSC in the world. Descriptive research about cataract types epidemiology in Indonesia is needed.

Keywords: Diabetes Mellitus, Senile Cataract, Posterior Subcapsular Cataract

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INTRODUCTION

According to the Indonesian Ministry of Health, in 2016, cataracts were the main cause of blindness throughout the world, as well as in Indonesia. ⁽¹⁾ According to WHO in 2010, cataract is the biggest cause, which is 51% of global causes of world blindness. ⁽²⁾

In Indonesia, the results of a blindness survey using the Rapid Assessment of Avoidable Blindness (RAAB) method that was recently conducted in three provinces (NTB, West Java, and South Sulawesi) in 2013-2014, found the prevalence of blindness in people aged > 50 years; an average yield of 3.2% with the main cause being cataracts (71%). Every year, new cases are estimated to increase by 0.1% of the total population or approximately 250,000 people / year. ⁽¹⁾ Basic Health Research (RISKESDAS) in 2013, stated the highest cataract prevalence in North Sulawesi (3.7%) followed by Jambi (2.8%) and Bali (2.7%). Most of the population with cataracts in Indonesia have not had cataract operations because of the patient's ignorance regarding the cataracts they suffered. ⁽³⁾

Cataracts are any opacities on the lens that can occur due to hydration (addition of lens fluid), denaturation of the lens protein, or both. Usually, opacity hits both eyes and progresses. In general, cataract is

a disease in the elderly, but it can also be caused by congenital abnormalities or chronic local eye complications.

In the Framingham Eye Study, the incidence of senile cataract was 42% in the 52-64 years age group, 73% in the 65-74 years age group, and 91% in the 75-85 years age group. This senile cataract rate is 90% of the overall cataract incidence. ^(4,5,6) Senile cataract is a cataract that occurs at the age above 50 years, but the cause of the occurrence of senile cataract is unknown. ⁽⁴⁾

From the results of epidemiological studies, cataract risk factors prove that senile cataract is a multifactorial disease, and different risk factors can play a role in different types of cataracts. Systemic diseases such as diabetes mellitus is a risk factor for senile cataracts. ⁽⁷⁾

Based on the location of formation, the most common type of cataract in diabetics is the subcapsular cortical or posterior type. Many studies, including large populations such as the Blue Mountains Eye Study and Beaver Dam Eye Study, report an increase in the prevalence and incidence of posterior subcapsular cataracts in patients with diabetes. ^(8,9) Subcapsular posterior cataract means opacity starts from the posterior region of the lens. ⁽¹⁰⁾

The incidence of cataracts and diabetes is still very high in Indonesia. However, this incident still could not be balanced with sufficient public knowledge. Therefore, research and data are needed regarding the correlation of diabetes history of diabetes with senile cataract types. Especially in the city of Surabaya, there has been no research on the relationship of diabetes mellitus with posterior subcapsular cataract types. Based on clinical considerations of an adequate sample, the authors would like to submit this study to determine whether there is an association between diabetes mellitus and the occurrence of posterior subcapsular type cataracts.

This study was conducted to determine the correlation between diabetes mellitus and the incidence of posterior subcapsular type senile cataracts in pre-surgery patients at PHC Hospital Surabaya

METHOD

This research is analytic with a cross-sectional study design approach. The analytic method means, in addition to identifying and measuring variables, researchers also look for correlations between variables to explain the events or phenomena observed. The variables included in the risk factors were diabetes mellitus, and the variables included the

effects were the incidence of posterior subcapsular type senile cataracts. Retrieval of research data is only done once, and no intervention in the sample (analytic observational). This design was chosen to determine the relationship between a history of diabetes mellitus and the incidence of posterior subcapsular cataracts in pre-surgery patients at PHC Hospital Surabaya. The independent variable in this study is diabetes mellitus. The dependent variable in this study was the posterior subcapsular-type senile cataract. The study population was all patients with senile cataract pre-surgery at the Eye Clinic at PHC Hospital Surabaya. The sample in this study is part of the population that has fulfilled the inclusion and exclusion criteria. The sampling technique in this study uses non-probability sampling, that is, consecutive sampling. In consecutive sampling, all subjects who arrive sequentially and meet the selection criteria will be included in the study until the required number of subjects is met. Inclusion criteria in this study were senile cataract pre-surgery patients at PHC Hospital Surabaya who had a history of diabetes mellitus with a complete medical record; and patients with pre-surgery senile cataract without a history of previous illnesses (diabetes mellitus, hypertension, and diseases coronary heart disease) after blood sugar,

blood pressure, and ECG tests with a complete medical record. The exclusion criteria for this study sample were a history of other previous diseases with diabetes mellitus (hypertension and coronary heart disease) after blood sugar, blood pressure, and ECG tests, and pre-surgery patients with a history of intraocular surgery (laser, trabeculectomy, and iridectomy). The research location chosen by the author is at the Eye Clinic of PHC Hospital Surabaya, Jalan Prapat Kurung Selatan No.1, Tanjung Perak, Surabaya, East Java, Indonesia. The study was conducted from June to November 2017. All quantitative data analysis in this study will use the IBM-SPSS version 23.00. Data will be analyzed bivariate to determine the relationship between the history of diabetes mellitus and the

incidence of posterior subcapsular type cataracts. To test the significance of the relationship, the authors used data analysis techniques using non-parametric statistical tests, namely the Spearman Correlation test.

RESULT

Based on the data collection process, we obtained tabulated data covering the presence of diabetes and cataract types. Furthermore, we performed a correlation analysis between cataract types and diabetes using the Contingency Coefficient analysis technique,

The α value was set at 0.05, so the correlation between variables was considered significant if the significance value or p value <0.05 .

Table 1 List of past illnesses and types of senile cataract pre-surgery patients at PHC Hospital Surabaya for the period July 2017 to November 2017.

No	Past Illnesses	Cataract Types
1	Non-Diabetes	PSC
2	Diabetes	Non-PSC
3	Non-Diabetes	PSC
4	Diabetes	Non-PSC
5	Non-Diabetes	PSC
6	Non-Diabetes	Non-PSC
7	Non-Diabetes	PSC

8	Non-Diabetes	PSC
9	Diabetes	PSC
10	Diabetes	Non-PSC
11	Diabetes	Non-PSC
12	Non-Diabetes	Non-PSC
13	Non-Diabetes	Non-PSC
14	Diabetes	Non-PSC
15	Non-Diabetes	Non-PSC
16	Diabetes	Non-PSC
17	Non-Diabetes	Non-PSC
18	Non-Diabetes	Non-PSC
19	Diabetes	Non-PSC
20	Diabetes	PSC
21	Diabetes	PSC
22	Diabetes	PSC

Table 2 Cataract Types Characteristics from Sample

Cataract Type	Frequency	Percentage
PSC	9	40.9 %
Non-PSC	13	59.1 %
Total	22	100.0 %

Table 2 shows that there were more non-PSC patients, namely 13 people or 59.1%, while patients with PSC were nine people or 40.9%.

Table 3 Past Illness Characteristics from Sample

Past Illness	Frequency	Percentage
Diabetes	11	50 %
Non-Diabetes	11	50 %
Total	22	100 %

Table 3 shows that of the 22 medical records studied, the frequency of samples with diabetes reached 11 people or 50%, while non-diabetics were 11 people or 50%.

Table 4 Cross table of previous diseases and types of senile cataracts from pre-surgery patients at PHC Hospital Surabaya from July 2017 to November 2017.

		Cataract Type				Total	
		PSC		Non-PSC			
		N	%	N	%	N	%
Past Illness	Diabetes	4	18.2%	7	31.8%	11	50.0%
	Non-Diabetes	5	22.7%	6	27.3%	11	50.0%
Total		9	40.9%	13	59.1%	22	100.0%

In this study, researchers used the IBM SPSS application (attached in the Appendix). The analysis showed that the correlation between diabetes and cataract PSC was found to be a value ($p = -0.092$, $p > 0.05$), so it can be concluded that H_0 was accepted and H_1 was rejected. Thus, it can be concluded that there is no

significant relationship between diabetes and the incidence of cataract PSC.

DISCUSSION

The sample used in this study is in the form of senile cataract patients who have met the inclusion criteria and are not included in the exclusion criteria. Research subjects who successfully met the inclusion criteria were 22 people.

Senile cataract patients who were the subjects of the study were in the age group ≥ 55 years. In this study, the percentage of male subjects was 18 people (51.4%) and women were 17 people (48.6%). This proves that the sex distribution of the sample is quite evenly distributed.

In European and African populations, diabetes is consistently identified as a risk factor for senile cataract with posterior subcapsular and cortical types, but diabetes is not identified as a risk factor for nuclear cataracts.⁽²⁸⁾

The Beaver Dam Eye Study links diabetes with cortical and posterior subcapsular cataracts.⁽²⁸⁾ The Waterloo Eye Study, which has reviewed 6397 clinical documents, found a diagnosis of type 2 diabetes led to the development of all types of cataracts. In further studies, it was found that the risk of subcapsular cortical and posterior cataracts was increased in patients with type 2 diabetes ($P < 0.05$).⁽²⁷⁾

Results from eight studies (two studies in France and Sweden, three studies in America, one study in Africa, and one study in Australia) involving 20837 subjects, including the BMC Ophthalmology meta-analysis in 2014, posterior subcapsular correlation (PSC) with diabetes had a very significant

relationship (OR = 1.55.95% CI: 1.27-1.90, $P < 0.001$).⁽²⁷⁾

A cross-sectional study from Richter et al., namely the Los Angeles Latino Eye Study, no correlation was found between diabetes and nuclear cataracts. Data analysis using Locally Weighted Scatterplot Smoothing (LOWESS) plots showed predictions of the prevalence of PSC cataracts after adjusting for stable covariates at levels of 8% to 11% HbA1c, then increasing at high levels of HbA1c. Thus, it can be concluded that diabetes is a significant risk factor for posterior subcapsular cataracts.⁽³⁰⁾

Meanwhile, according to a Korea National Health and Nutrition Examination Survey study, in Asian populations, the distribution of cataracts shows different results, so the distribution of cataract types around the world must be further investigated. In Korea, the prevalence of nuclear cataracts is highest (16%) in people with diabetes, followed by cortical cataracts (5.6%) than posterior subcapsular cataracts (1.8%). In Kinmen, Taiwan, nuclear cataracts are also the most common type of cataract, followed by cortical cataracts in people with diabetes. In India, the spread of cataract types has different results. Cortical cataracts have the highest prevalence (15.1%) followed by nuclear cataracts (5.0%), then posterior subcapsular cataracts (1.1%).⁽²⁹⁾

PSC consists of dysplastic lens fibers, which migrate to the posterior pole of the lens so that the lens is cloudy. Increased degenerative changes, with posterior polar plaque-like cataract discoid formation accompanied by accumulation of extracellular material⁽³⁰⁾. Increased degenerative changes and extracellular material accumulation can occur in diabetic patients due to sorbitol accumulation through polyol pathways, photooxidative stress, and AGE accumulation^(16,21,23,24). The exact pathology of PSC cataract formation itself is unknown. However, there appears to be a role for genetic mutations.⁽³¹⁾ Wiley et al. showed the loss of p53 in the mouse lens caused PSC formation due to failure in the process of deletion of lens cells that proliferated abnormally⁽¹⁷⁾. It can be concluded that underlying not all diabetic patients suffering from PSC is the absence of genetic mutations. It has been recognized that inheritance of PSC formation is seen to follow an autosomal dominant pattern⁽³¹⁾. This is what causes the distribution of PSC cataract types in the world differently.

CONCLUSION

Research on the correlation between Diabetes Mellitus and the incidence of subcapsular posterior type cataracts in cataract pre-surgery patients at PHC

Hospital Surabaya can be concluded as follows:

1. The incidence of senile cataracts with posterior subcapsular type in cataract pre-surgery patients at PHC Hospital Surabaya is as much as 40.9%.
2. The incidence of senile cataract with non-posterior subcapsular type in patients with senile cataract pre-surgery at PHC Hospital Surabaya was 59.1%.
3. The incidence of posterior subcapsular cataracts in patients with senile cataract pre-surgery with Diabetes Mellitus at PHC Hospital Surabaya is as much as 18.2%.
4. The incidence of posterior subcapsular cataracts in senile cataract pre-surgery patients without Diabetes Mellitus at PHC Hospital Surabaya is as much as 31.8%.
5. There is no significant correlation between diabetes mellitus and the incidence of cataracts with posterior subcapsular type in pre-surgery patients at PHC Hospital Surabaya.

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