Folia Medica Indonesiana Vol. 48 No. 3 July-September 2012 : 137-143

EFFECT OF TYPE-2 DIABETES MELLITUS ON CATARACT INCIDENCE RATE AT OPHTHALMOLOGY OUTPATIENT CLINIC, DR SOETOMO HOSPITAL, SURABAYA

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ABSTRAK

Diabetes mellitus telah dilaporkan sebagai faktor yang paling penting yang menyebabkan loss. Diabetes visual yang mellitus juga dikenal sebagai faktor risiko penting untuk katarak. Diabetes menyebabkan katarak melalui jalur sorbitol. Pasien dengan latar belakang diabetes akan memiliki kesempatan lebih besar untuk terjadi katarak di usia yang lebih muda dibandingkan dengan pasien tanpa latar belakang diabetes. Tujuan dari penelitian ini dilakukan untuk menganalisis korelasi antara diabetes mellitus tipe 2 dan usia penampilan katarak. Penelitian ini merupakan studi kasus kontrol. Sembilan puluh enam pasien katarak pada unit rawat jalan dari Eye di Rumah Sakit Dr. Soetomo menjalani evaluasi ophthalmologic dipelajari secara retrospektif. Penderita katarak diklasifikasikan ke dalam kelompok diabetes (kelompok kasus) dan kelompok kontrol (yaitu kelompok tanpa diabetes). Ukuran sampel diambil menggunakan jumlah kelompok kasus sampling dan random sampling untuk kelompok kontrol, pada periode Januari - Juli 2011. Data dikumpulkan dengan menggunakan data sekunder i. e. rekam medis pasien. Data dianalisis secara deskriptif dengan menggunakan tabulasi silang dan analitik menggunakan uji Mann-Whitney dan uji korelasi Spearman. Faktor risiko seperti jenis kelamin, umur, dan durasi diabetes (dalam kelompok kasus) juga diamati. Wanita lebih umum pada kedua kelompok. Usia rata-rata dari penampilan katarak pada kelompok diabetes lebih muda dari kelompok kontrol. Katarak belum menghasilkan adalah jenis yang paling umum katarak pada kedua kelompok. Durasi rata-rata diabetes pada kelompok diabetes adalah 80,67 bulan. Uji Mann-Whitney mengungkapkan bahwa usia terjadinya katarak pada kelompok diabetes secara signifikan berbeda (p = 0,000) dengan kelompok kontrol. Analisis korelasi Spearman menunjukkan bahwa tidak ada hubungan yang signifikan antara durasi diabetes dan usia terjadinya katarak (p = 0.964, dengan koefisien korelasi = -0.007). Kesimpulannya, diabetes mellitus tipe 2 secara signifikan berhubungan dengan usia terjadinya katarak. Temuan ini menunjukkan bahwa diabetes dapat mempercepat terjadinya katarak. ***(FMI 2012;48:137-143)***

Kata kunci: *diabetes mellitus tipe-2, katarak, kecepatan terjadinya katarak*

ABSTRACT

Diabetes mellitus has been reported as the most critical factor causing visual loss.Diabetes mellitus is also known as an important risk factor for cataracts. Diabetes induces cataract through the sorbitol pathway. Patients with diabetic background will have bigger chance to occur cataract in younger age than patients without diabetic background. The purpose of this study was performed to analyze the correlations between type 2 diabetes mellitus and the age of cataract appearance. This study was a case control study. Ninety six cataract patients at outpatient unit of Eye in Dr. Soetomo Hospital underwent ophthalmologic evaluation were studied retrospectively. Cataract patients were classified into a diabetic group (case group) and control group (i.e. a group without diabetes). Sample size was taken using total sampling case group and random sampling for control group, in the period of January – July 2011. Data were collected by using secondary data i. e. patient's medical record. Data were analyzed descriptively using cross-tabulation and analytically using Mann-Whitney test and Spearman Correlation test. Risk factor like sex, age, and duration of diabetes (in case group) were also observed. Females were more common in both groups. The mean age of cataract appearance in diabetic group was younger than control group. Immature cataract was most common type of cataract in both groups. The mean duration of diabetes in diabetic group was 80,67 months. Mann-Whitney test revealed that age of cataract occurrence in diabetic group was significantly differ (p = 0,000) with control group. Spearman correlation analysis showed that there was no significant correlation between duration of diabetes and the age of cataract occurrence(p= 0,964, with coefficient of correlation = -0,007). In conclusion, Type 2 diabetes mellitus was significantly related to the age of cataract occurrence. This finding indicated that diabetes can accelerate the occurrence of cataract. ***(FMI 2012;48:137-143)***

Keywords: *type 2 diabetes mellitus, cataract, the age of cataract occurrence*

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INTRODUCTION

Diabetes mellitus is a chronic disease that occurs when the pancreas is unable to produce enough insulin or when the body is unable to use the insulin produced effectively. Insulin is a hormone that regulates blood sugar levels. Hyperglycemia, or increased blood sugar, is the most common effect of uncontrolled diabetes and the longer it can wreak havoc on some serious bodily systems, especially the nerves and blood vessels (World Health Organization 2011). This disease often bring severe disabilities with a variety of complications, including blindness, heart and kidney disease, and neuropathy (Suyono 2000). Patients with diabetes mellitus have a tendency to be more susceptible to microangiopathy and macroangiopathy compared with non-DM patients, making it easier to vascular disruption. These complications can lead to vision disorders, myocardial infarction, renal disorders, gangrene, and increased mortality (Tjokroprawiro 2009, Indraswati 2010).

Diabetes mellitus can be found in almost all societies around the world. More than 220 million people are affected by diabetes mellitus (Suyono 2000). In 2004, about 3.4 million people die as a result of high blood sugar levels. More than 80% of deaths attributable to diabetes occur in countries with lower middle economies (World Health Organization, 2011). In the retrospective study in Eye Clinic, Dr. Soetomo Hospital during the one-year period of January to December 1993, acquired blindness due to diabetic retinopathy rate of 5% of all patients who come (Suhendro 1999, Nuradianti 2010).

Diabetes mellitus has been reported as the most important factor that can cause a decrease in visual (Kim et al 2006). Impaired vision in diabetics more (11%) than non-diabetics (5.9%) (Swann, 1999, Zhang et al 2008). Among the various complications of diabetes mellitus in the eye, diabetic retinopathy is considered as the most common cause of visual disturbances (Kim et al 2006). All the structure of the eye, not just the retina, are vulnerable to the adverse effects of diabetes (Kahn et al, 2004). In the eyes of people with diabetes, there can be changes in optical components, both the cornea, lens, and retina due to the change of some parameters such as duration of illness of diabetes, blood glucose levels, insulin use, and the presence of diabetic retinopathy (North 1998). Some examples are the refractive index changes, damage to the cornea, glaucoma, cranial neuropathy, papillopathy and one of them is cataracts (Swann 1999).

Cataract is the cause of 52% of cases of blindness throughout the world. Vision impairment and blindness is still a health problem in Indonesia. Sense Health Survey in 1993 - 1996 showed 1.5% of Indonesia's population of blindness caused by cataract (52%), glaucoma (13.4%), refractive error (9.5%), retinal disorders (8.5%), corneal abnormalities (8.4%) and other eye diseases (Ministry of Health, Republic of Indonesia, 2010). Cataracts are opacities in the lens (Riordan-Eva and Whitcher, 2010). It has been generally known that the age-related cataract or senile cataract is a multifactorial disease (Ughade et al 1998). Determinants of the most responsible of cataract occurrence in Indonesia at the age of 30 years and above were age (OR 2.14 to 15), followed by glaucoma (OR 3.02 95% CI 2.63 to 3.46), diabetes mellitus (OR 2, 08, 95% CI 1.92 to 2.25), the main job (OR 1,15.-1.8), drinking alcohol (OR 1.47 95% CI 1.37 to 1.58), education (OR 1.4 95% CI 1.34 to 1.46), female gender (OR 1.33 95% CI 1.27 to 1.39) (Tana 2009). Cataracts are formed earlier and developed more rapidly in the presence of diabetes. More easily find cataracts in people with diabetes as much as 1.6 times more than those without diabetes (Kahn et al 2004).

Researchers are interested to determine the effect of type 2 diabetes mellitus on the visual disturbances, particularly the onset of cataracts, since it is known that one of the complications of diabetes mellitus type 2 is to eye cataracts. So far there has been no research on the effects of a history of Type 2 Diabetes Mellitus on the speed of onset of cataract in Outpatient Ophthalmology Installation, Dr. Soetomo Hospital. The researcher intends to examine the association of diabetes with a history of cataracts at the age of IRJ Eye Dr. Soetomo Hospital. The purpose of this study was to analyze the effect of a history of Type 2 Diabetes Mellitus on the speed of a cataract.

MATERIALS AND METHODS

This study is an observational analytic study conducted case control. The study population was patients with type 2 diabetes mellitus and cataracts were consulted by Department of Internal Medicine to Eye Outpatient Clinic, Dr. Soetomo Hospital. The control group were patients with non-diabetic and suffering from cataracts who visit the Eye Outpatient Clinic, Dr. Soetomo Hospital. Samples were taken from the study populations months from January to July 2011. The sampling technique the cases in this study carried out by total sampling period from January to July 2011.

The study was conducted at the Outpatient Unit of the Department/SMF Unit of Ophthalmology and Medical Record Medical Faculty Airlangga University/Dr. Soetomo Hospital, August 2011 to September 2011. The data collection technique by using secondary data, ie data taken from the status of patients at health Medical Document (DMK) in the form of the current age, the age of a cataract, sex, duration of diabetes, and type cataract maturity. The collected data were then grouped, made in the form of tabulation. Statistical tests using Mann - Whitney and Pearson correlation test. Mann - Whitney conducted to determine whether there were differences between age cataracts in the case and control groups. Spearman correlation test was performed to determine the correlation between the duration of diabetes mellitus by the age of cataract in the case group. Used computer software SPSS 17 for data analysis.

RESULTS

This study is an observational case-control analytic studies conducted on the subject of the study consisted of patients with cataract in Eye Outpatient Clinic, Dr. Soetomo Hospital, both of which have a history of type 2 diabetes or not. The subjects of the study were tabulated in several characteristics to determine the distribution of research data.

Table 1. Distribution of study subjects by sex

Sex	Case Group		Control Group	
	Total	Percentage (%)	Total	Percentage (%)
Female	29	60.42%	30	62.5%
Male	19	39.58%	18	37.5%
Total	48	100%	48	100%

The subjects of the study period from January to July 2011 as many as 96 people, consisting of 48 people from the group and 48 cases in the control group. The average age of patients is currently the case group were younger than the control group. 46-50 year age group had the highest number (41.7%) in the case group, and the highest age group 61-66 years (64.6%) in the control group.

Table 2. The mean and standard deviations based on the age of the subject of current research

Group age	Minimum value	Maximum value	Mean	SD
Case (year)	41	60	48.92	4.457
Control (year)	42	66	60.56	4.774

The youngest age of a cataract in the case group was 41 and the oldest age was 65 years cataracts. The average age of a cataract in the case group (48.88) younger than the control group (60.4). From Table 5.3, obtained 46-50 year age group had the highest number in the case group, and the 61-65 age group most in the control group.

Table 3. Distribution of study subjects by age cataract

Age	Case Group		Control Group	
	Total	Percentage (%)	Total	Percentage (%)
40 – 45	11	22.9%	1	2.1%
46 – 50	20	41.7%	1	2.1%
51 – 55	14	29.2%	3	6.2%
56 – 60	3	6.2%	12	25%
61 – 65	0	0%	31	64.6%
Total	48	100%	48	100%

It appears that the distribution of study subjects both case and control groups based on the type of its maturity, the most abundant being immature cataracts. While this type of cataract is the least mature cataracts. The subjects consisted of 48 people in each group, then within each group there are 96 pieces of the eye, the right eye and left eye. In this case, the type of cataract maturity is calculated from each fruit's eyes, not in the form of pairs.

Table 4. Distribution of study subjects by type of cataract maturity

Cataract Maturity	Case Group		Control Group	
	Total	Percentage (%)	Total	Percentage (%)
Incipient	13	13.54%	25	26.04%
Immature	71	73.96%	61	63.54%
Mature	12	12.5%	10	10.42%
Total	96	100%	96	100%

It appears that the characteristics of the subject groups was based on the long-suffering diabetes cases in which the minimum duration is 2 months and a maximum duration was 312 months (26 years) with a mean of 80.67 months. If the duration of the disease is divided into five-year time span it appears that most of the study subjects (27 people or 56.25%) claimed to suffer from diabetes between 1-60 months (under 5 years).

It can be concluded from the results of Mann-Whitney test, the age difference between groups significant cataract cases (cataract patients who have a history of suffering from Diabetes Mellitus Type 2) with the control group (cataract patients with no history of Diabetes Mellitus Type 2) (Table 7).

There was no significant correlation between the duration of Type 2 Diabetes Mellitus with the age of a cataract, since $p < 0.05$. This can be shown by the value of the correlation coefficient is very weak, i.e, 0,007 to the direction of the negative correlation (Table 8)

Table 5. The mean and standard deviations duration of DM

	Minimum Value	Maximum Value	Mean	SD
DM Duration (months)	2	312	80.67	71.53

Table 6. Distribution of study subjects by duration ofdiabetes in a 5-year time span

DM Duration	Total	Percentage (%)
1 – 60	27	56.25%
61 – 120	12	25%
121 – 180	4	8.33%
181 – 240	4	8.33%
241 – 300	0	0
301 – 360	1	2.09%
Total	48	100%

Table 7. Test Non-Parametric Mann-Whitney

DM History		Mean (years)	SD	Mann-Whitney Test
Age of cataract onset	No DM (control group)	60.40	4.77	Sig. 2-tailed 0.000
	DM (case group)	48.88	4.77	

Table 8. Correlation between duration of type 2 diabetes mellitus and age there is a cataract

Variables	Coefficient correlation	p
DM duration and cataract age	-0,007	0.964

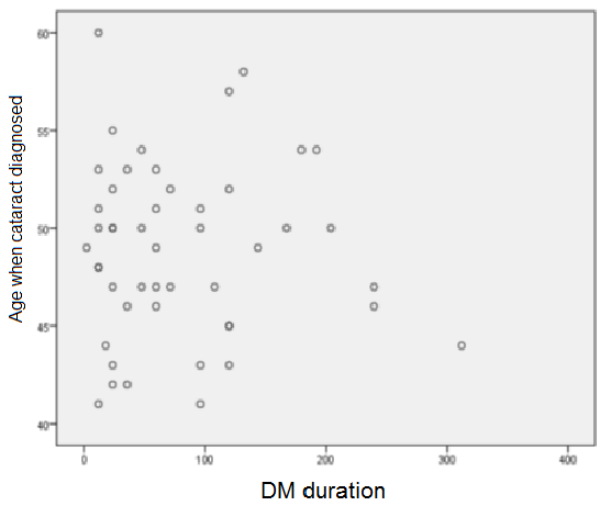

Figure 1. Scatter Diagram correlation between the duration of diabetes mellitus at the age of (undiagnosed) cataracts

DISCUSSION

According to research conducted by the R & D Lusianawati Tana (2009), one of the determinants that affect the outcome of cataract is female gender with an OR of 1.33. This is also in accordance with the study conducted by Kim et al (2006) on the prevalence and risk factors of cataracts in patients with type 2 diabetes mellitus in Korea. The subjects of the study comprised a total of more female DM patients (60%) than men (40%) and diabetic patients with cataract are also more women (63.5%) than men (36.5%). In theory, one of the diseases more common in women than men is Diabetes Mellitus (Budiarto 2002). Thus, in theory, the distribution of study subjects is appropriate.

Age of the patient at this time is not equal to the age of cataract. Most of the data show the current age of the patient at the time of the cataract patient age or when first diagnosed with cataracts. However, there are some cataract patients aged younger than 1 year of age at this time. This is because the data collection was done in the period from January to July 2011, so the age of cataract range for the month. Researchers took the data of patients who first came in January - July 2011, no patients in the control but the first came in before January 2011. The age at this time, last time was calculated from the control patients. For example, patients first come in the range from January to July 2011, and control until the last month of November 2011, the age of the patient is calculated according to the current month of November 2011.

40-65 year age restriction because at the age of 30 years is still obtained juvenile cataract patients, and at the age of 65. There are a lot of people with senile cataract. The researcher intends to examine diabetic cataracts, so it is necessary to exclude the possibility of patients affected by juvenile or senile cataracts by age restrictions. The age group 46-50 years in the case group is a group of the majority. This is similar to research conducted by Indraswati (2010) to study the relationship with HbA1c levels of GDA and lens thickness in patients with type 2 diabetes mellitus that the 46-50 year age group is a group of cataract patients with type 2 diabetes the most (30.3%). Whereas in the control group, the age group 61-65 years group. This was in accordance to research conducted by Tana (2009) that the age group 55-64 years who suffered from cataracts alone, more than the age group below. Both the research conducted by Tana (2009) as well as research conducted by McCarty et al (1999) on the epidemiology of cataract in Australia, both show that the occurrence of cataract increased with increasing age. In theory, the incidence of cataract increases with age. It is appropriate for most cataract age in the control group. However, cataracts also occur

more rapidly, from the age of 40 years, for patients with diabetes mellitus. It is also appropriate for the case group. Therefore, we can conclude the distribution of study subjects according to the theory are also suitable.

In the group of cases and controls, maturities are the most common type of cataract is immature. In some studies researchers use as reference, not the classification obtained by type of cataracts maturity, but cataracts classification based on other things. Epidemiological studies of cataract in Australia conducted by McCarty et al (1999), based on anatomic criteria to classify cataracts, cortical cataracts namely, nuclear cataracts, and subcapsular cataracts, and several other studies used a classification based on age and etiology of cataract. Researchers classify cataract maturity because it follows the classification based on medical record data that researchers get from DMK-5 Eye Clinic, Dr Soetomo Hospital, which based on its maturity.

Good research subjects in the control group and case, kind of maturity the most common cataract is immature cataracts. This is because it's been a lot of free cataract operations in Indonesia. At the Dr. Soetomo Hospital, the cataract down the middle class and who have a SSN, was able to get a cataract surgery facility. This makes the maturity of cataract of the patients who are still preliminary, could soon be operated so as not to be mature and grown up hypermaturity.

Duration of DM in cataract patients who also suffer from type 2 diabetes, showed a minimum duration of 2 months and a maximum of 312 months (26 years) with a mean of 80.67 months (6.7 years). Kim et al (2006) in his study, the mean duration of type 2 diabetes mellitus for the subjects of the study was 13:03 ± 6.96 years. Wiemer (as cited in Indraswati 2010) in his study of the subjects of the study the average gain in the year for the duration of type 2 diabetes was 9.0 ± 7.4. If the duration of the disease is divided into five-year time span it appears that most of the study subjects (27 people or 56.25%) claimed to suffer from diabetes between 1-60 months (under 5 years). This is according to research conducted by Indraswati (2010) that the duration of diabetes is most between 1-60 months (under 5 years). Shorter duration of diabetes in this study is likely due to subjects less aware of the early symptoms of diabetes (Indraswati 2010).

The relationship between a history of type 2 diabetes mellitus by age cataracts have actually been much studied. Many studies prove that Diabetes Mellitus be risk factors for cataract, which is the research conducted by Tana (2009), Kim et al (2006), and Taylor (1999). In fact, the research conducted by Swann (1999) on "Non-Retinal Ocular Change In Diabetic Patients", became one of the cataract eye complications in patients with both type 1 diabetes mellitus or type 2 Diabetes Mellitus therefore have been known to be associated, and as one of the risk factors for cataract, then in this study, researchers wanted to know whether diabetes mellitus can significantly influence the occurrence of cataract in terms of age, in this case accelerates the onset of cataracts.

Based on the descriptive data processing in the previous chapter, most age groups in the case group (46-50 years) younger than the control group (61-65 years). The mean age of the case group were younger than the control group. Based on these results, we can conclude that the cataract group suffering Diabetes Mellitus Type 2 tend to be younger than those who did not suffer from cataracts Diabetes Mellitus Type 2. Based on the analytical data processing using a non-parametric test of Mann-Whitney, there is a significant age difference between the groups of patients cataract with type 2 Diabetes Mellitus with a group of cataract patients without diabetes mellitus type 2. Based on these results, we can conclude that the group of cataract patients with type 2 diabetes mellitus was significantly younger than the group of cataract patients without type 2 Diabetes Mellitus.

In general, most cataracts occur at the age of 60 years, because the lens begins to thicken (Laursen & Fledelius 1979, Klein et al 1998, Dorairaj et al, 2002, Indraswati 2010). Cataracts have a wide variety of risk factors, one of them is addressed in this study is Diabetes Mellitus. Diabetes Mellitus is able to induce cataract through the sorbitol pathway, where more and more blood sugar levels, the more accumulation of sorbitol due to increased activity of aldose reductase. Persistent accumulation of sorbitol damaging ion pumps work and an increase in the levels of sodium, so the lens to swell. In this phase, is already happening dense nuclear opacities (Kinoshita 1974, Indraswati 2010). Cataracts usually occurs at the age of 60 years. However, patients with type 2 diabetes mellitus may have cataracts sooner, ie at the age of 40 years. In patients with diabetes mellitus type 2, the accumulation of sorbitol occurs more rapidly, especially in patients with diabetes mellitus at a younger age, the onset of complications of cataract is also faster.

In theory, cataracts formed earlier and developed more rapidly in the presence of diabetes. More easily find cataracts in people with diabetes as much as 1.6 times more than those without diabetes. People who are diagnosed with diabetes at age 30 years or older, cataracts are the main visual complications. In the Beaver Dam Eye study, people with type 2 diabetes is

very easy to develop opacification of the lens cortex than non-diabetes in the same age range. Many factors associated with the development of cataracts, including experience with diabetes and retinopathy status in patients with type 1 diabetes, use of diuretics, and HbA1C levels (Kahn et al, 2004). Through this research, the above theory can be proven. Cataract patients with type 2 diabetes mellitus were significantly younger than non-DM. So it can be concluded, Diabetes Mellitus Type 2 is able to accelerate the occurrence of cataract.

Results of descriptive data processing mentioned that the duration of Type 2 Diabetes Mellitus at most between 1-60 months. This could be due to most of the new patients know that they are suffering Diabetes Mellitus when there are complaints of the eyes. Therefore, patients with newly diagnosed type 2 diabetes mellitus when people come see the eyes, because there was previously no other complaints. This makes the duration of Diabetes Mellitus calculated to be shorter, thus affecting the results of the research. Based on the non-parametric Spearman's test results, we can conclude there is no correlation between the duration of Type 2 Diabetes Mellitus with the age of a cataract or a very weak correlation. However, the direction of the correlation is negative, which means the greater the duration of diabetes mellitus, cataract increasingly younger age. This is consistent with the theory, that the longer suffer from diabetes mellitus will be easier or faster to happen cataracts.

CONCLUSION

History of Type 2 Diabetes Mellitus has significant effect on the age of a cataract.

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