Original Article

Trends in Diabetic Retinopathy Severity among Patients at A Tertiary Care Eye Hospital: A Call to Strengthen Preventive Care

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ABSTRACT

Purpose: To analyze trends in diabetic retinopathy (DR) and its management at a tertiary healthcare center from January 2016 to December 2019.

Study Design: Descriptive study.

Place and Duration of Study: National Eye Center, Cicendo Eye Hospital, from August to September 2020.

Methods: Data were obtained from the diabetic retinopathy database in the vitreo-retina unit. Information on patients' sex, age, diagnosis, and treatment from each year was retrospectively reviewed. Inclusion criteria encompassed all first-time DR patients scheduled for pan-retinal photocoagulation (PRP) laser, anti-VEGF injection, or pars plana vitrectomy (PPV). Patients with incomplete data or repeated visits were excluded. Among 63,824 records analyzed, 22,169 met the inclusion criteria. Patients were categorized into vision-threatening diabetic retinopathy (VTDR), requiring treatment at the first visit, and non-VTDR.

Results: Of the 22,169 patients included, 53.88% were female, and the majority were aged between 50 and 59 years. VTDR accounted for 19.12% of cases, while 80.88% were non-VTDR. Annual trends revealed changes in DR management approaches, with an increasing prevalence of VTDR and PPV emerging as the most frequently performed treatment.

Conclusion: The predominance of non-VTDR cases highlights the urgent need for improved DR management at primary and secondary healthcare levels. Strengthening early detection and intervention protocols is essential to prevent disease progression and alleviate the burden on tertiary care facilities.

Key words: Diabetes Mellitus, Diabetic Retinopathy, Vision Threatening Diabetic Retinopathy.

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INTRODUCTION

Diabetic retinopathy is one of the leading causes of blindness. It deserves attention due to the substantial risk of blindness that can occur as the number of diabetics worldwide is on the rise. Globally, an estimated 422 million adults were living with diabetes in 2014 compared to 108 million in 1980.[1] Indonesia was the 5th country with the highest number of people with diabetes in 2019.[2] According to the 2018 Basic Health Research study, the prevalence of diabetes mellitus among individuals aged 15 years and older increased by 2% compared to 2013 data.[3] This rise highlights a growing risk of developing diabetic retinopathy over the lifetime for those affected.[4]

According to the Eye Disease Prevalence Research Group, vision threatening diabetic retinopathy(VTDR)

is defined as any clinically significant non-proliferative diabetic retinopathy, proliferative diabetic retinopathy, or macular edema.[5] Diabetic retinopathy can progress to a terminal state and cause permanent damage to vision and even blindness. The management of diabetic retinopathy can be carried out at various levels of healthcare, as preventive, curative and rehabilitative measures.[6] Treatments in the form of laser pan retinal photocoagulation (PRP), injection of anti- *vascular endothelial growth factor* (VEGF), and pars plana vitrectomy (PPV) are performed according to the severity of the disease. While tertiary care canters are essential for managing advanced stages of DR, the focus must shift towards prevention to curb the progression of the disease. By the time a patient requires tertiary-level intervention, the disease has often reached a stage where vision loss is significant and may be irreversible.

National Eye Centre, Cicendo Eye Hospital as a tertiary healthcare provider and eye referral centre, delivers subspecialty services which are not available at a lower-level healthcare service. Optimal management of DR at primary and secondary healthcare providers is expected to reduce the progression rate so that the number of VTDR sufferers can be reduced. VTDR management is not entirely the domain of tertiary healthcare services, since PRP and anti-VEGF injections can be provided in secondary healthcare providers by general ophthalmologists according to their competence level. Thus, the number of DR cases which are treated in tertiary eye hospital may indicate the management success of DR at primary and secondary level.[1,4] The purpose of this observational study is to describe the pattern of cases and management of DR at the National Eye Centre of Cicendo Eye Hospital as tertiary eye hospital.

METHODS

This is a descriptive study conducted at the National Eye Centre, Cicendo Eye Hospital Bandung from August to September 2020.We collected data of DR patients between 2016 and 2019 from the database of the Vitreoretina Unit. The study protocol was reviewed and approved by the Institutional Review Board with protocol number LB.02.01/2.3/9069/2020. A retrospective analysis of the previously collected, de-identified data from medical records was done. There was no direct patient involvement for the purpose of this research. According to the ethical guidelines and relevant regulatory standards, informed consent was not required, as the study posed no risk to participants and maintained full anonymity.

The inclusion criteria in this study were all diabetic retinopathy patients who presented to Cicendo Eye Hospital from 2016 to 2019 with the first visit planned for a PRP laser, anti-VEGF injection, or PPV treatment. The exclusion criteria in this study were incomplete patient data and those with repeated visits. Records of 63,824 patients were analysed, and 41,655 patients were not included due to incomplete data or incomplete diagnosis. The rest of the 22,169 patients who met the inclusion criteria were categorized as VTDR and non-VTDR patients. The data collected in this study were gender, age, year of visit, diagnosis, and the type of treatment. The results were presented both in tables and as descriptive summaries. Data and statistical analyses for this study were performed using Microsoft Excel.

RESULTS

Out of the 22,169 patients, 10,224 (46.12%) were male, and 11,945 (53.88%) were female (see Table 1). The largest age group comprised patients aged 50–59 years. An increasing trend in the total number of DR cases at Cicendo Eye Hospital over the years is illustrated in Figure 1.

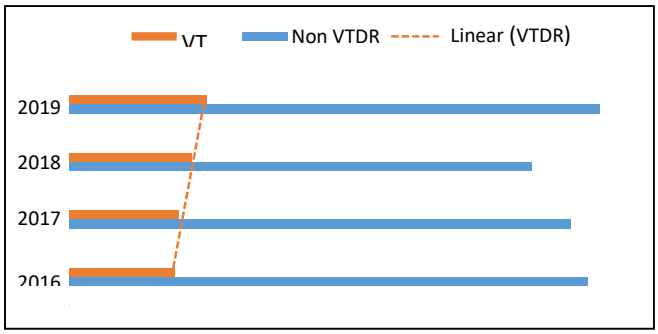

Figure 1: The trend pattern of total number diabetic retinopathy cases in Cicendo Eye Hospital.

Table 2 shows that the percentage of non-VTDR cases decreased from 2016 to 2019, while VTDR cases increased during the same period. Table 3 highlights a decline in the percentage of pars plana vitrectomy (PPV) as a treatment from 2016 to 2019, whereas the percentage of pan-retinal photocoagulation (PRP) increased until 2018 before declining in 2019.

Table 1: *Demographic Of Diabetic Retinopathy Patients in Cicendo Eye Hospital*

Patient's (n =22.169)	2016	2017	2018	2019	Total
Gender					
Male	2.653(11,97%)	2.511(11,33%)	2.376(10,72%)	2.684(12,11%)	10.224(46,12%)
Female	2.909(13,12%)	2.931(13,22%)	2.837(12,80%)	3.268(14,74%)	11.945(53,88%)
Age					
<30 years old	281(1,27%)	300(1,35%)	272(1,23%)	289(1,30%)	1.142(5,15%)
30-39 years old	270(1,22%)	298(1,34%)	280(1,26%)	268(1,21%)	1.116(5,03%)
40-49 years old	1007(4,54%)	1.008(4,55%)	937(4,23%)	1.147(5,17%)	4.099(18,49%)
50-59 years old	2.026(9,14%)	1.931(8,71%)	1.861(8,39%)	2.313(10,43%)	8.131(36,68%)
60-69 years old	1.497(6,75%)	1.493(6,73%)	1.417(6,39%)	1.499(6,76%)	5.906(26,64%)
>70 years old	481(2,17%)	412(1,86%)	446(2,01%)	436(1,97%)	1.775(8,01%)

Table 2: *The distribution of patients with VTDR and non-VTDR.*

Diagnosis	2016	2017	2018	2019
Non-VTDR	4.616 (82,99%)	4.468 (82,10%)	4.118 (78,99%)	4.728 (79,46%)
VTDR	946 (17%)	974 (17.89%)	1.095 (21%)	1.224 (20.56%)
TOTAL	5562	5442	5213	5952

Table 3: *The distribution of treatment received by VTDR patients.*

Procedure	2016	2017	2018	2019
Anti-VEGF	66 (6.98%)	8 (0,82%)	36 (3,29%)	210 (17,16%)
PRP Laser	342 (36,15%)	354 (36,34%)	447 (40,82%)	347(28,35%)
PPV	538(56,87%)	612 (62,83%)	612 (55,89%)	66and 7(54,49%)
TOTAL	**946**	**974**	**1095**	**1224**

DISCUSSION

Diabetic retinopathy is a health problem that deserves attention due to its magnitude in various aspects. The number of visits of DR patients has changed every year, with the number of VTDR patients being less than the number of non-VTDR patients. The higher number of non-VTDR patients in this study can illustrate the increasing growth of DR and the risk of developing into VTDR if the appropriate therapy is not provided. Management in the form of systemic therapy can be provided in primary and secondary healthcare services. Studies show that optimal control of risk factors, such as blood sugar levels, blood pressure, and lipid profiles can reduce and slow disease progression. Patients with severe DR have poor quality of life and require specialist vitreoretinal services than patients with less severe DR.[1,7,8]

In 2019, Sapkota et al, reported a higher number of female patients with diabetes than males with a mean age of 57 years.[9] Meanwhile, in a study conducted by Muqit, et al, in Bangladesh, male patients had a higher risk of developing DR than female patients in all age groups.[10] However, Sasongko, et al, in Yogyakarta, reported no significant difference in the DR between female and male patients.[11] The results obtained in this study are in line with the study by Sapkota et al, where the number of female patients was more than male patients, and the largest age group with DR were those aged 50-59.[9] Loss of visual acuity due to DR leads to limitations in daily activities, and economic burden for individuals, families, and communities.[9,10,11]

In this study, the number of VTDR patients increased every year. This is in accordance with the Basic Health Research (Riskesdas) report which showed the prevalence of diabetes mellitus in the Indonesian adult population was 6.9% in 2013 and rose to 8.5% in 2018.[3] Sangupta et al, reported that 30% of diabetic patients are also diagnosed with VTDR.[12] With the increasing number of diabetes mellitus patients, the number of VTDR patients is also on the rise.

In this study, the incidence of DR in the Vitreoretinal Unit outpatient clinic decreased from 2016 to 2017, then fell further in 2018, before increasing again in 2019. According to research by Rahmawati et al, there were external and internal factors that affect outpatient visits.[13] The external

factors are the patient's distance and transportation modalities to the hospital, their income, and health insurance coverage. The internal factors are the hospital itself as a healthcare provider. The utilization of health services by the community is affected by several factors, namely perceptions of health and disease, symptoms of illness, knowledge and understanding of disease, and their belief in health services or doctors who can cure their illness. Other influencing factors are socio-demographic, family factors, distance travelled, service availability, and cost accessibility.[3,12]

The World Health Organization(WHO) predicts that diabetes mellitus will afflict more than 21 million Indonesians in 2030.[13] According to a study by Nentwich et al, the likelihood of suffering complications from diabetes mellitus increases with the duration of the disease.[14] The risk factors associated with diabetic retinopathy and VTDR in Indonesia include the duration of diabetes, fasting blood sugar level, and history of hypertension.[11] This study did not include data on the duration of DM, type of DM, or other risk factors that may also play a role.[15-17]

The percentage of VTDR patients in 2016 was 17%, increasing to 17.8% in 2017. It continued to rise in 2018 to 21% but decreased to 20% in 2019. Based on their study in 2012, Yau et al, stated that 93 million people have diabetic retinopathy, where 17 million suffered from proliferative diabetic retinopathy, 21 million with diabetic macular edema, and 28 million with VTDR.[18] In this study, 35 studies conducted from 1980 to 2008 showed the overall prevalence was 34.6% for diabetic retinopathy, where 6.96% for proliferative diabetic retinopathy, 6.81% for diabetic macular edema, and 10.2% for VTDR.[8,19]

Laser photocoagulation is effective in slowing down the progression of retinopathy and preventing visual impairment, but it cannot restore previously damaged vision. The use of laser procedures in 2016 were 35.15% and increased to 35.34% in 2017. It rose further in 2018 to 40.82% before falling to 28.35% in the following year. Laser PRP is a procedure within the competency of general ophthalmologists and can be performed without the need for referral to a higher level of healthcare. In cases of milder disease, PRP laser therapy may be administered to prevent progression to terminal stages, which would otherwise require subspecialty surgical intervention. However, PRP laser equipment is currently available in only seven health centers in Bandung. This limited availability may explain the low number of laser procedures observed in this study. Efforts to ensure equitable distribution of laser equipment among secondary healthcare providers and to enhance general ophthalmologists' proficiency in laser procedures are encouraged to optimize treatment at the secondary care level. This approach is supported by findings from the ETDRS study, which reported a 4% lower risk of vitrectomy at five years in patients receiving early PRP laser therapy.[20-21]

Although laser photocoagulation was considered as the main therapy in diabetic retinopathy, the use of anti-VEGF injections has revolutionized the treatment of DR.[23] The Diabetic Retinopathy Clinical Network conducted a randomized multicentre clinical trial and demonstrated the role of ranibizumab in reducing the risk of short-term exacerbations of macular edema. According to Osaadon et al., who compared PRP laser with a combination of PRP laser and injection of ranibizumab or bevacizumab, the combination therapy gave better results than the single PRP laser therapy.[22] In this study, the use of anti-VEGF injection decreased significantly in 2016 from 6.98% to 0.82% in 2017. This was due to the unavailability of drugs in 2017 at Cicendo Eye Hospital so that anti-VEGF injections were diverted to eye clinics or other hospitals that provide anti-VEGF injections. In 2018, there was an increase to 3.29% and it rose again by 17.16% in 2019 after the drug was available again.

In this study, the number of PPV were raised every year. This indicates that diabetic retinopathy patients who progressed into a terminal state also increased. Preventive and curative measures that can be provided at primary and secondary healthcare facilities in the form of blood sugar control and initial treatment at a milder degree can reduce disease progression that will eventually require surgical intervention.[24]

Actions that can be taken in primary healthcare are chronic disease management programs (PROLANIS). This program consists of a proactive approach that involves patients with chronic diseases so that they can achieve an optimal quality of life. Secondary healthcare providers can also play an active role in initial treatment, either by doing follow-up screening of diabetic retinopathy patients, providing management for patients with mild and moderate severity, and referring to tertiary healthcare providers if further actions, such as surgery, are needed. As a tertiary healthcare provider, Cicendo Eye Hospital is a

referral centre for primary and secondary health services which provides sub-specialty management that cannot be provided in the primary healthcare services. Interventions carried out in tertiary healthcare services aim to restore or improve the vision as much as possible. Patients with terminal degree of illness and is not possible to receive intervention, can be provided with rehabilitation services at tertiary healthcare facilities to improve their quality of life.[24-25]

The main limitation of this study is the lack of detailed information in the data, as it does not specify the degree of diagnosis or treatment for each eye. Additionally, there is missing information regarding the severity of the disease, which prevented us from conducting an analysis based on the exact degree of diabetic retinopathy (DR) severity. For future research, it is recommended to include additional data on risk factors associated with DR. Previous studies have identified these risk factors to include the type and duration of diabetes mellitus, vital signs, and comprehensive laboratory results.

CONCLUSION

The management of diabetic retinopathy at Cicendo Eye Hospital evolves annually, with pars plana vitrectomy (PPV) being the most frequently performed procedure. As a tertiary healthcare provider, PPV is exclusively performed by subspecialty clinicians. However, the significant rates of laser treatments and anti-VEGF injections highlight the growing demand for non-surgical interventions. To address this, the implementation and enhancement of diabetic retinopathy treatment programs by primary and secondary healthcare providers can play a critical role as preventive or curative measures. These initiatives aim to halt disease progression, reducing the need for surgical interventions at tertiary care levels.

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Patient's Consent: Researchers followed the guidelines set forth in the Declaration of Helsinki.

Conflict of Interest: Authors declared no conflict of interest.

Ethical Approval: The study was approved by the Institutional review board/Ethical review board **(LB.02.01/2.3/9069/2020)**.

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Authors Designation and Contribution

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