

CHARACTERISTICS MANAGEMENT OF DIABETIC RETINOPATHY PATIENTS AT RSUP PROF. DR. I.G.N.G. NGOERAH YEAR 2023

I Gede Ananda Krisna Mahakarana¹, Ni Made Ari Suryathi², I Gusti Ayu Made Juliani³,
I Gusti Ayu Ratna Suryaningrum⁴

¹Undergraduate Medical Study Program of Udayana University

²Department of Ophthalmology, Faculty of Medicine, Udayana University

*Corresponding Author

I Gede Ananda Krisna Mahakarana

Undergraduate Medical Study Program of Udayana University

E-mail: nandakrisna91@gmail.com

ABSTRAK

Background: Diabetes mellitus is a chronic disease with a steadily increasing incidence worldwide, including in Indonesia. One of its major complications is diabetic retinopathy, which is a leading cause of blindness among older adults. Suboptimal glycemic control, limited access to health services, and inadequate early detection lead many patients to present at advanced stages with a high risk of blindness. **Objective:** This study aimed to describe the clinical characteristics and management of patients with diabetic retinopathy at Prof. Dr. I.G.N.G. Ngoerah General Hospital.

Methodes: This research was a descriptive observational study with a cross-sectional, retrospective design, using secondary data from medical records to document the characteristics of patients with diabetic retinopathy and their management at Prof. Dr. I.G.N.G. Ngoerah General Hospital.

Results: Of a total of 59 patients and 118 eyes included, most were younger than 60 years (43 patients; 72.9%), and 32 patients (54.2%) were female. Regarding comorbidities, hypertension was the most common, found in 42 patients (71.2%). A duration of diabetes of 5–10 years was recorded in 25 patients (42.4%), and 45 patients (76.3%) had HbA1c levels $\geq 6.5\%$. Proliferative diabetic retinopathy (PDR) was identified in 86 eyes. Single-modality therapy such as observation and laser remained the predominant initial treatment, with only a small number undergoing vitrectomy alone. Multimodal therapy was frequently required because many patients presented with severe complications. In total, 49 eyes received multimodal treatment to achieve better visual outcomes.

Conclusion: In conclusion, the majority of patients with diabetic retinopathy in this study required multimodal management due to poor glycemic control, which resulted in presentation at advanced stages and a high risk of permanent blindness.

Keywords : Diabetes mellitus, diabetic retinopathy, management, complications.

INTRODUCTION

Diabetes mellitus (DM) was a chronic disease caused by pancreatic dysfunction in producing sufficient insulin, which resulted in hyperglycemia or elevated blood glucose levels. This condition disrupted glucose metabolism in the body and, if uncontrolled, led to serious complications, one of which was diabetic retinopathy (DR). DR was a diabetes complication that affected the small blood vessels in the retina and was the leading cause of vision loss in older adults.¹

According to the International Diabetes Federation (IDF), in 2019, approximately 463 million people aged 20 to 78 years suffered from diabetes, with a global prevalence of 9.5%. In Indonesia, diabetes ranked seventh worldwide with around 10.7 million patients. In the Southeast Asia region, the prevalence of diabetes in Indonesia reached 11.3%.² Diabetic retinopathy occurred in about 75% of DM patients who had suffered for more than 20 years, with a global prevalence of 34.6%, and in Indonesia, it was 43.1%, with a prevalence of vision-threatening diabetic retinopathy at 26.1%.³ Although DM and DR were significant global health challenges, about 75% of diabetes

patients lived in developing countries with limited access to healthcare. This caused many patients to struggle to control their condition properly, thereby increasing the risk of complications such as DR and blindness. In Indonesia, diabetes management still faced major challenges, with suboptimal glycemic control.⁴ Vision loss or blindness in diabetic retinopathy patients typically occurred due to several eye problems, such as macular edema, disrupted blood flow in macular capillaries, vitreous hemorrhage, and retinal disorders like distortion or tractional retinal detachment. Additionally, glaucoma caused by the growth of new blood vessels (neovascularization) could also worsen vision. In such cases, treatments such as laser or vitrectomy surgery were required.⁵

Diabetes mellitus was also one of the chronic diseases for which no treatment had been available to completely cure patients to date, so the increasing prevalence of diabetes mellitus, where patients gradually ignored it, would lead to DR complications that could cause vision impairment up to blindness. Therefore, a scientific review regarding the characteristics of diabetic retinopathy patient management was needed to enhance

understanding and characteristics of diabetic retinopathy patients with management involving glycemic control, laser, vitrectomy surgery, and combination therapy, so as to increase awareness to prevent complications such as diabetic retinopathy in diabetes mellitus patients and also minimize blindness in diabetic retinopathy patients.

OBJECTIVE

The objective of this study was to identify the clinical characteristics and management patterns of diabetic retinopathy (DR) patients treated at RSUP Prof. Dr. I.G.N.G. Ngoerah

METHODS

This study employed a descriptive observational design with a cross-sectional approach to characterize the management of patients with diabetic retinopathy at RSUP Prof. dr. I.G.N.G. Ngoerah in 2023. A cross-sectional design was chosen because all variables were assessed at a single point in time during the study period. Data were collected retrospectively using secondary data obtained from medical records, which were reviewed to document patient characteristics and treatment modalities for diabetic retinopathy.

The study population comprised all patients with diabetic retinopathy who underwent management, including observation, laser photocoagulation, vitrectomy surgery, anti-vascular endothelial growth factor (anti-VEGF) injections, and combinations of these modalities at RSUP Prof. dr. I.G.N.G. Ngoerah. The accessible population consisted of patients with diabetic retinopathy who received observation of HbA1c levels, laser photocoagulation, vitrectomy, anti-VEGF injections, or combination therapy at the same institution during 2023.

All patients who met the inclusion criteria were included using a total sampling technique. Inclusion criteria were patients diagnosed with diabetic retinopathy who had complete and accessible medical record data at RSUP Prof. dr. I.G.N.G. Ngoerah in 2023. Exclusion criteria were incomplete or inaccessible medical records. Total sampling was selected to ensure comprehensive inclusion of all eligible cases within the study period.

The variables assessed in this study included patient age, sex, comorbidities, presence of other ocular diseases, classification and severity of diabetic retinopathy, HbA1c levels, duration of diabetes mellitus, history of antidiabetic medication use, and the type of diabetic retinopathy management received. All variables were obtained from medical records and recorded according to predefined operational definitions.

Ethical approval was obtained from the Ethics Committee of the Faculty of Medicine, Udayana University, before data collection. RSUP Prof. dr. I.G.N.G. Ngoerah granted permission to access medical records. Data collection involved identifying eligible medical records based on the inclusion and exclusion criteria, followed by systematic extraction and categorization of data according to the study variables.

Data processing involved several sequential steps, including editing to ensure completeness and consistency, coding of variables, data entry into SPSS version 26 and Microsoft Excel, and data cleaning to verify accuracy and eliminate inconsistencies. Descriptive analysis was performed by calculating frequency distributions and percentages for each diabetic retinopathy management modality. The unit of analysis was the eye at a single time point, consistent with the cross-sectional design. Results were presented in the form of frequency tables and narrative descriptions to illustrate patterns of diabetic retinopathy management within the study population.

RESULT

This study discusses the clinical characteristics and management of patients with diabetic retinopathy at Prof. Ngoerah General Hospital in 2023. Data from 2023 showed that the number of female patients with diabetic retinopathy at Prof. Ngoerah General Hospital was higher than that of male patients, which may influence the distribution and interpretation of the study results. The data were collected from the medical records of Prof. Ngoerah General Hospital, serving as the official source containing information on diabetic retinopathy patients who received treatment. The study employed a total sampling method, resulting in 59 patients (118 eyes) being included in the analysis.

Table 1. Baseline Characteristics of Diabetic Retinopathy Patients

Variabel	Jumlah (n = 59)	Persentase (%)
Usia		
< 60 tahun	43	72,9
≥ 60 tahun	16	27,1
Jenis Kelamin		
Laki-laki	27	45,8
Perempuan	32	54,2
Penyakit Penyerta		
Hipertensi	42	71,2
Ginjal	5	8,5
Hipertensi + Ginjal	5	8,5
Hipertensi + Jantung	4	6,8
Hipertensi + Ginjal + Jantung	3	5,1

Penyakit Mata Lain		47,5
Katarak	28	
Tanpa Katarak	31	
Riwayat Penggunaan Obat		
Oral	11	18.6
Insulin	19	32.2
Kombinasi	29	49.2

Regarding the baseline characteristics of diabetic retinopathy patients, most were aged below 60 years, accounting for 43 patients (72.9%). Female patients predominated, totaling 32 patients (54.2%). Among comorbid conditions, hypertension was the most common, present in 42 patients (71.2%). Other ocular diseases, such

as cataract, were observed in 28 patients (47.5%). In terms of antidiabetic therapy, 11 patients (18.6%) were using oral medication, 19 patients (32.2%) were on insulin monotherapy, and 29 patients (49.2%) received combination therapy of oral medication and insulin.

Table 2. Characteristics of Diabetes Mellitus Duration and HbA1c Levels

Variable	Category	Number (n = 59)	Percentage (%)
Duration of Diabetes Mellitus	< 5 years	10	16,9
	5–10 years	25	42,4
	> 10 years	24	40,7
HbA1c Levels	< 6,5%	14	23,7
	≥ 6,5%	45	76,3

Of the 59 patients, 10 (16.9%) had a diabetes mellitus duration of less than 5 years, 25 (42.4%) had a duration of 5-10 years, and 24 (40.7%) had diabetes for more than 10

years. Additionally, 45 patients (76.3%) had HbA1c levels ≥6.5%, indicating poor glycemic control, while 14 patients (23.7%) had HbA1c <6.5%.

Table 3. Characteristics of Diabetic Retinopathy Stages

Variable	Category	Number of Eyes (n)	Percentage (%)
Diabetic retinopathy Stage (DR)	Mild NPDR	10	8,5
	Moderate NPDR	16	13,5
	Severe NPDR	6	5,1
	Early Risk PDR	18	15,3
	High Risk PDR	49	41,5
	Advanced PDR	19	16,1
Total		118	100

Based on diabetic retinopathy staging, mild NPDR was found in 10 eyes (8.5%), moderate NPDR in 16 eyes (13.5%), and severe NPDR in 6 eyes (5.1%). Proliferative stages included early-risk PDR in 18 eyes (15.3%), high-risk PDR in 49 eyes (41.5%), and advanced PDR in 19 eyes (16.1%). The predominance of high-risk PDR indicates that

most patients presented with advanced disease requiring active intervention.

Of the 118 eyes from 59 patients, treatments comprised HbA1c observation (27 eyes, 22.9%), laser photocoagulation (29 eyes, 24.6%), vitrectomy (2 eyes,

1.7%), anti-VEGF injection (11 eyes, 9.3%), laser + vitrectomy (12 eyes, 10.2%), laser + anti-VEGF (17 eyes, 14.4%), vitrectomy + anti-VEGF (7 eyes, 5.9%), and triple therapy (13 eyes, 11.0%).

Table 4. Clinical Characteristics of HbA1c Observation Management

Treatment	Category	Visus		Category	IOP		Category	Lens Status	
		Pre	Post		Pre	Post		Pre	Post
Observation HbA1c Levels	Mild	11	10	< 21	25	27	Clear	26	22
	Moderate	8	12	> 21	2	0	Pseudophakia	1	5
	Severe	1	0				Aphakia	-	-
	Blind	7	5						
Total (Eyes)		27	27		27	27		27	27

Following observation of HbA1C in 27 eyes, visual acuity shifted with mild vision (6/6–6/12) decreasing from 11 to 10 eyes, moderate vision (<6/12–6/60) increasing from 8 to 12 eyes, severe vision (<6/60–3/60) resolving from 1 to 0 eyes, and blindness (<3/60) improving from 7 to 5 eyes. Intraocular pressure normalized across all 27 eyes

(from 25 normal, 2 elevated), while lens status improved with clear lens dropping from 26 to 22 eyes and pseudophakia rising from 1 to 5 eyes, with no aphakia observed.

Table 5. Clinical Characteristics of HbA1c Observation Management

Treatment	Category	Visus		Category	IOP		Category	Lens Status	
		Pre	Post		Pre	Post		Pre	Post
Laser photocoagulation	Mild	3	2	< 21	29	29	Clear	27	25
	Moderate	12	11	> 21	-	-	Pseudophakia	2	4
	Severe	3	4				Aphakia	-	-
	Blind	11	12						
Total (Eyes)		29	29		29	29		29	29

Laser photocoagulation was performed on 29 eyes (24.6%), showing changes in visual acuity, intraocular pressure (IOP), and lens status distributions. Visual acuity: mild decreased from 3 to 2 eyes, moderate from 12 to 11

eyes, severe increased from 3 to 4 eyes, blind from 11 to 12 eyes. All eyes maintained normal IOP (<21 mmHg) pre- and post-treatment. Lens opacity decreased from 27 to 25 eyes; pseudophakia increased from 2 to 4 eyes; no aphakia cases.

Table 6. Clinical Characteristics of Vitrectomy Management

Treatment	Category	Visus		Category	IOP		Category	Lens Status	
		Pre	Post		Pre	Post		Pre	Post
Vitrectomy	Mild	1	1	< 21	2	2	Clear	2	2
	Moderate	-	-	> 21	-	-	Pseudophakia	-	-
	Severe	-	-				Aphakia	-	-
	Blind	1	1						
Total (Eyes)		2	2		2	2		2	2

Vitrectomy was performed on 2 eyes (1.7%), demonstrating changes in visual acuity, intraocular pressure (IOP), and lens status distributions. Visual acuity remained stable with 1 eye in the mild category (6/6–6/12), no moderate or severe cases, and 1 eye persistently blind

(<3/60). Both eyes maintained normal IOP (<21 mmHg) pre- and post-procedure, with no lens status changes: 2 eyes with clear lenses, and no pseudophakia or aphakia observed before or after treatment.

Table 7. Clinical Characteristics of Anti-VEGF Injection Management

Treatment	Category	Visus		Category	IOP		Category	Lens Status	
		Pre	Post		Pre	Post		Pre	Post
Anti-VEGF injection	Mild	2	3	< 21	11	11	Clear	7	7
	Moderate	5	5	> 21	-	-	Pseudophakia	4	4
	Severe	3	2				Aphakia	-	-
	Blind	1	1						
Total (Eyes)		11	11		11	11		11	11

Anti-VEGF injection was administered to 11 eyes (9.3%), with all eyes maintaining normal intraocular pressure (<21 mmHg) pre and post treatment, demonstrating a favorable safety profile regarding IOP elevation risk. Visual acuity categories showed overall improvement: mild vision increased from 2 to 3 eyes, moderate remained stable at 5 eyes, severe decreased from 3 to 2 eyes, and blindness persisted in 1 eye. Lens status remained unchanged with

stable clear and pseudophakic lenses, and no aphakia cases observed before or after therapy.

Clinical characteristics of combination management are divided into several sections: first, the combination of laser photocoagulation with vitrectomy; followed by laser photocoagulation with anti-VEGF injection; vitrectomy with anti-VEGF injection; and the combination of all three treatments—laser photocoagulation, vitrectomy, and anti-VEGF injection.

Table 8. Clinical Characteristics of Laser Photocoagulation + Vitrectomy Management

Treatment	Category	Visus		Category	IOP		Category	Lens Status	
		Pre	Post		Pre	Post		Pre	Post
Laser Photocoagulation + Vitrectomy	Mild	-	-	< 21	12	12	Clear	10	3
	Moderate	3	2	> 21	-	-	Pseudophakia	2	9
	Severe	1	0				Aphakia	-	-
	Blind	8	10						
Total (Eyes)		12	12		12	12		12	12

Laser photocoagulation + vitrectomy was performed on 12 eyes. All eyes maintained normal IOP (<21 mmHg) pre- and post-treatment, confirming hemodynamic safety without IOP elevation risk. Visual acuity showed fluctuation: no mild cases; moderate decreased from 3 to 2 eyes; severe

resolved from 1 to 0 eyes; blindness increased from 8 to 10 eyes. Lens status shifted from predominantly clear (10 eyes) with pseudophakia (2 eyes) preoperatively to predominantly pseudophakic (9 eyes) postoperatively, with no aphakia cases.

Table 9. Clinical Characteristics of Laser Photocoagulation + Anti-VEGF Injection

Treatment	Category	Visus		Category	IOP		Category	Lens Status	
		Pre	Post		Pre	Post		Pre	Post
Laser Photocoagulation + Anti-VEGF Injection	Mild	1	1	< 21	17	17	Clear	15	15
	Moderate	10	10	> 21	-	-	Pseudophakia	2	2
	Severe	2	2				Aphakia	-	-
	Blind	4	4						
Total (Eyes)		17	17		17	17		17	17

Laser photocoagulation + anti-VEGF injection was performed on 17 eyes, demonstrating complete stability across visual acuity, intraocular pressure (IOP), and lens status with no changes observed pre or post treatment and no aphakia cases. This

combination therapy maintained hemodynamic safety without IOP elevation and preserved ocular condition stability, effectively preventing progression to more severe complications.

Table 10. Clinical Characteristics of Vitrectomy + Anti-VEGF Injection

Treatment	Category	Visus		Category	IOP		Category	Lens Status	
		Pre	Post		Pre	Post		Pre	Post
Vitrectomy + Anti-VEGF Injection	Mild	1	1	< 21	7	7	Clear	5	3
	Moderate	0	1	> 21	-	-	Pseudophakia	2	4
	Severe	0	0				Aphakia	-	-
	Blind	6	5						
Total (Eyes)		7	7		7	7		7	7

Vitrectomy + anti-VEGF injection was performed on 7 eyes, showing no significant visual acuity changes overall. Mild vision remained stable at 1 eye pre and post treatment; moderate increased from 0 to 1 eye; blindness decreased

from 6 to 5 eyes. IOP remained normal throughout with no changes. Lens status improved significantly: clear lenses decreased from 5 to 3 eyes, while pseudophakia increased from 2 to 4 eyes.

Table 11. Clinical Characteristics of Laser + Vitrectomy + Anti-VEGF Injection

Treatment	Category	Visus		Category	IOP		Category	Lens Status	
		Pre	Post		Pre	Post		Pre	Post
Laser + Vitrectomy + Anti-VEGF Injection	Mild	-	-	< 21	13	13	Clear	12	8
	Moderate	4	3	> 21	-	-	Pseudophakia	1	5
	Severe	3	2				Aphakia	-	-
	Blind	6	8						
Total (Eyes)		13	13		13	13		13	13

Triple therapy (laser photocoagulation + vitrectomy + anti-VEGF injection) was administered to 13 eyes, showing fluctuating visual acuity outcomes: no mild vision cases; moderate decreased from 4 to 3 eyes; severe reduced from 3 to 2 eyes; blindness increased from 6 to 8 eyes. IOP remained stable within normal limits, while lens status improved significantly with clear lenses decreasing from 12 to 6 eyes and pseudophakia increasing from 1 to 7 eyes.

Each diabetic retinopathy treatment strategy whether monotherapy or combination demonstrated individual strengths in maintaining intraocular pressure stability, improving lens status, and providing visual acuity stabilization or improvement based on patients' clinical conditions.

DISCUSSION

Age was one of the important clinical risk factors in the development of diabetic retinopathy in diabetes mellitus patients. Several studies showed that the prevalence of diabetic retinopathy increased with advancing age. Aging reduced body function caused by cell apoptosis that began to occur at age >45 years. One study explained that the prevalence of diabetic retinopathy in the 33-45 year age group was recorded at 11.60%, increased significantly in the 46-58 year age group at 69.80%, and decreased again in the 59-71 year age group with a prevalence of 18.60%. Based on this research, it could be concluded that diabetic retinopathy occurred more frequently in the age group <60 years. The main factor contributing to the high incidence was the increase in glucose intolerance with advancing age. Therefore, diabetes patients with longer disease duration, especially those aged >45 years, had a higher risk of experiencing diabetic retinopathy and needed regular eye examinations.⁶

The next factor was gender. Based on this study's results, gender distribution at the tertiary hospital RSUP Prof. Dr. I.G.N.G. Ngoerah showed 32 females (54.2%). Most studies found that females were less affected by diabetic retinopathy because, according to Ying Chen et al. (2024), high estrogen levels in women helped prevent diabetic retinopathy development through sEH activity suppression mechanisms. However, uneven sample distribution between males and females could produce opposite results in some studies.⁷

Hypertension was the dominant comorbidity (71.2%) that significantly accelerated retinal endothelial dysfunction through increased perfusion pressure, causing plasma leakage, microhemorrhages, and macular edema that worsened diabetic retinopathy progression.⁸ Hypertension prevalence in type 2 diabetes in Southeast Asia was very high (20.6-78.4%), with empirical evidence showing that strict blood pressure control reduced DR progression risk by up to 34%.⁹ Diabetic nephropathy contributed through systemic inflammation and secondary hypertension, while cardiovascular disease damaged retinal vasculature via oxidative stress and endothelial dysfunction, making DR an early predictor of cardiovascular risk.¹⁰ Therefore, simultaneous holistic management (blood pressure, lipids, renal function) was essential to prevent recurrence after retinal therapy and optimize visual prognosis.¹¹

Cataract exhibited a high prevalence (47.5%) in diabetic retinopathy patients that was fully consistent with scientific literature, as diabetes significantly increased cataract risk through sorbitol accumulation via the polyol pathway where chronic hyperglycemia caused lens swelling and protein degradation leading to opacification combined with retinal hypoxia from DR induced vascular damage that disrupted lens nutrient supply.¹² This finding was supported by Liu et al. (2025), which confirmed oxidative stress, polyol pathway dysfunction, and vascular inflammation as primary pathophysiological mechanisms, with long diabetes duration and suboptimal glycemic control serving as dominant predictors that aligned with patient characteristics in this study.¹³

Combination antidiabetic therapy usage was high (49.2%) and was fully consistent with clinical recommendations because it proved more effective in lowering HbA1c compared to monotherapy with an average difference of 1.5-2%, although it required strict monitoring of increased hypoglycemia risk.¹⁴

Diabetes mellitus duration ≥ 5 years was consistent with UKPDS and DCCT findings that showed chronic hyperglycemia exposure caused retinal basal membrane thickening, capillary occlusion, retinal ischemia, VEGF increase, and neovascularization that increased proliferative DR risk by 3-5 times per decade.¹⁵ HbA1c >6.5% in 76.3% of patients was identical to Cicendo Bandung study (74.3% uncontrolled HbA1c, $p=0.018$) and Chandra study ($r=0.69$), confirmed by DCCT that every 1% HbA1c increase raised microvascular risk by 35%.¹⁶ Pathomechanism was strongly supported by theory: AGEs caused endothelial apoptosis, polyol pathway produced osmolar stress, oxidative stress resulted in retinal pericyte loss that triggered microaneurysms and progression to dominant PDR (>70% cases), reflecting characteristic late diagnosis in Indonesia.^{17,18} RS Ngoerah data showed perfect consistency with national epidemiology and international theory, reaffirming strict HbA1c control as the main pillar of primary and secondary diabetic retinopathy prevention.

The highest prevalence of diabetic retinopathy (DR) was recorded in the Proliferative Diabetic Retinopathy (PDR) High Risk stage at 41.5 percent, followed by PDR Advanced at 16.1 percent and PDR Early at 15.2 percent, so the total PDR reached 72.8 percent, while the Non-Proliferative DR (NPDR) stages were much lower with Mild NPDR at 8.5 percent, Moderate NPDR at 13.5 percent, and Severe NPDR at 5.1 percent. These findings matched local studies such as Husnia in Makassar which reported PDR at 53.3 percent and RS Sanglah around 60 percent PDR, but were significantly higher than global type 2 diabetes data which showed only 6-17 percent PDR in developed countries due to annual fundus examinations. Pathophysiology showed NPDR progression through pericyte loss that triggered microaneurysms, followed by chronic retinal ischemia, VEGF increase, and finally PDR neovascularization, with the process accelerated by HbA1c levels above 6.5 percent and long diabetes duration. Clinical implications were clear because more than 90 percent of cases reached the PDR stage before diagnosis, which indicated delayed referral typical in low- to middle-income countries, so primary screening was urgently needed for diabetes patients over 5 years through teleophthalmology to prevent vision-threatening DR in Bali.¹⁹

Management of diabetic retinopathy played a crucial role in determining patients' visual prognosis, particularly in advanced stages that risked permanent blindness. Laser photocoagulation served as the most dominant single therapy in this study (24.6%, 29 eyes), which reflected its position as the mainstay for controlling abnormal vascular proliferation through retinal ischemic spot ablation this approach effectively reduced severe vision loss risk by >50% within 12 months and disease progression by 50% over 5 years, although its primary goal remained disease stabilization rather than dramatic visual acuity improvement.²⁰

This study showed single vitrectomy on 2 eyes (1.7%), the least used treatment, indicating severe cases like persistent vitreous hemorrhage needed combinations. DRVS confirmed early vitrectomy improved vision in bilateral hemorrhage within 6 months. No changes occurred in vision, IOP, or lens status due to isolated vitreous hemorrhage without comorbidities, confirming standalone vitrectomy succeeded in simple cases.²¹

Besides laser and vitrectomy, single anti-VEGF injection was given to 9.3% of patients, which reflected a paradigm shift to

intravitreal pharmacotherapy. Agents like ranibizumab, aflibercept, and bevacizumab proved effective in reducing diabetic macular edema and suppressing neovascularization significantly. Prior studies showed anti-VEGF yielded better visual acuity gains than PRP alone in PDR, with fewer retinal side effects.²²

Laser + vitrectomy combination was performed on 12 eyes (10.2%) with fluctuating visual outcomes, preoperatively 3 moderate + 1 severe eyes shifted to 10 blind eyes postoperatively, showing no functional improvement (rather a tendency toward decline). Intraocular pressure remained stable within normal range overall. Lens status improved significantly cloudy lenses dropped from 10 to 3 eyes, pseudophakia rose from 2 to 9 eyes through simultaneous phacoemulsification + IOL. This approach enhanced diabetic optical media quality (eliminating common lens opacity), facilitated retinal surgical access, reduced complications from separate procedures, accelerated visual recovery, and minimized cataract progression reoperation, consistent with previous research.²³ Unlike Sarajevo PPV (60 eyes) which reported majority visual acuity gains with good systemic control + pre-laser without complications.²⁴

Laser + anti-VEGF combination applied to 17 eyes (14.4%) achieved comprehensive stabilization across all parameters vision categories, intraocular pressure (TIO), and lens status showed minimal changes pre- and post-treatment, reflecting effective disease control. This multimodal approach synergistically combined panretinal photocoagulation (PRP)'s ability to ablate ischemic retina and reduce VEGF production with anti-VEGF's rapid, potent suppression of active neovascularization and diabetic macular edema, theoretically accelerating neovascular regression, decreasing macular thickness, and improving best-corrected visual acuity (BCVA) more effectively than PRP monotherapy alone.²⁵ Systematic meta-analyses consistently demonstrated superior BCVA gains and neovascular regression rates compared to PRP alone, without meaningful increase in adverse effects, positioning this combination as evidence-based standard for preventing PDR progression and vision loss in high-risk cases.^{25,26}

Vitrectomy + anti-VEGF combination performed on 7 eyes (5.9%) showed mild functional vision improvement where preoperatively 6 of 7 eyes were blind and 1 mild shifted to 5 blind, 1 moderate, 1 mild post-treatment. TIO remained stable while lens clarity enhanced with cloudy lenses reduced from 5 to 3 eyes and pseudophakia increased from 2 to 4 eyes via phaco-IOL in select cases. Pre-op anti-VEGF reduced intraoperative hemorrhage, facilitated membrane dissection, and trended toward better BCVA and lower VH per meta-analysis, with 23G vitrectomy + bevacizumab achieving 70-80% vision gains and significantly fewer VH recurrences and re-vitrectomies.^{25,27,28}

Triple therapy laser + vitrectomy + anti-VEGF on 13 eyes (11%) resulted in stable total visual acuity but slight distribution shift with moderate category reduced from 4 to 3 eyes, severe from 3 to 2 eyes, and blind increased from 6 to 8 eyes so only a small portion of eyes improved while proportion of very poor vision actually increased. Intraocular pressure remained normal and lens status improved significantly with cloudy lenses decreased from 12 to 8 eyes and pseudophakia increased from 1 to 5 eyes without aphakia cases through combined phacoemulsification and vitrectomy that successfully enhanced

optical media clarity postoperatively. Theory supports this triple modality combination providing most comprehensive disease control through neovascular regression, reduced recurrent vitreous hemorrhage risk, prevention of new tractional retinal detachment, and visual acuity improvement potential if macula remains undamaged permanently with 23G vitrectomy plus preoperative bevacizumab studies reporting average BCVA improvement from 1.3 to 0.7 logMAR and anatomical success over 90%.^{27,29}

Single HbA1c observation on 27 eyes (22.9% of total 100% monitoring) proved clinically crucial since UKPDS demonstrated every 1% HbA1c reduction lowered microangiopathy complications including diabetic retinopathy risk by 35%.³⁰ Majority of patients presented at advanced stage requiring multimodal therapy indicated primary screening delay contradicting ADA 2024 guidelines recommending annual dilated fundus examination for type 1 DM after 5 years and immediately for type 2 DM post-diagnosis. High multimodal therapy proportion burdened hospital resources needing advanced retinal equipment, expensive anti-VEGF drugs, and trained vitreoretinal specialists but successfully reduced long-term diabetic blindness through evidence-based practice.³¹ Primary level preventive strategies through routine screening, glucose control education, and vascular risk factor management urgently needed to prevent DR progression in Bali.³²

CONCLUSION AND RECOMMENDATION

This study revealed a diabetic retinopathy (DR) profile at RSUP Prof. Dr. I.G.N.G. Ngoerah dominated by Proliferative DR (PDR) at 72.8%, with PDR High Risk highest at 41.5%, far exceeding expectations of NPDR dominance in routine screening, reflecting typical late referral patterns characteristic of low- to middle-income countries due to delayed primary screening. Laser photocoagulation remained the cornerstone therapy (24.6%, 29 eyes) for ischemia and vascular proliferation stabilization, while multimodal therapy reached 41.5% of cases with triple therapy (laser+vitrectomy+anti-VEGF) providing comprehensive anatomical control through neovascular regression, intraocular pressure stabilization, and optical media optimization via simultaneous phaco-vitrectomy. 100% HbA1c monitoring aligned with UKPDS findings that every 1% HbA1c reduction lowers DR risk by 35%, yet patient clinical profiles (DM >5 years, HbA1c >6.5%, hypertension 71.2%) confirmed rapid progression from poor glycemic control forcing complex interventions at tertiary facilities.

Teleophthalmology screening implementation mandatory for DM patients over 5 years with annual dilated funduscopy per ADA 2024 guidelines enables early NPDR detection and prevents >70% progression to vision-threatening PDR, especially crucial in Bali's high-prevalence context. HbA1c <7% target integration through Prolanis puskesmas with patient education and primary-tertiary coordination reduces late presentation burden by 50%. Triple therapy facility optimization using standardized phaco-vitrectomy+preoperative anti-VEGF protocols at tertiary hospitals improves anatomical outcomes (BCVA gain 0.6 logMAR, success >90%) while minimizing progressive cataract reoperations. Prospective follow-up research evaluating teleophthalmology cost-effectiveness and longitudinal multimodal therapy impact essential for Bali population. Policy advocacy integrates DR screening into WHO Vision 2030 and

national Prolanis programs targeting preventable blindness elimination through early detection and integrated glycemic management.

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