





ISSN: 2091-2749 (Print)
2091-2757 (Online)

Submitted on: 27 Apr 2024

Accepted on: 28 May 2024

<https://doi.org/10.3126/jpahs.v11i1.66397>

Use of intravitreal bevacizumab among patients undergoing retinal surgical interventions in a military hospital: a descriptive cross-sectional study

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Abstract

Introduction: Bevacizumab, a monoclonal antibody that hinders the activity of vascular endothelial growth factor, is extensively utilized within the field of ophthalmology. The utilization of Bevacizumab, particularly in retinal surgeries, lacks comprehensive investigation. The objective of this study is to determine the prevalence of intravitreal Bevacizumab usage in retinal surgical procedures conducted at a tertiary care center.

Method: A retrospective descriptive cross-sectional study was conducted among patients who underwent retinal surgical interventions at a tertiary care center in Nepal. Data of patients who underwent retinal surgical interventions from 14 April 2022 to 16 November 2023 were collected from hospital records. The study employed a convenience sampling method. Data analysis was conducted using Statistical Package for Social Sciences (SPSS) Version 20. The point estimate was computed at a 95% Confidence Interval.

Result: Among 1674 different ocular surgeries, intravitreal Bevacizumab injections were used in 453(27.06%) at 95% CI (24.94-29.19) patients. Central Retinal Vein Occlusion (CRVO) was identified as the predominant indication, accounting for 249(54.97%) patients. A majority of injections were administered to a single eye, accounting for 381(84.11%) patients. Additionally, 194(42.83%) patients received Bevacizumab as a one-time treatment.

Conclusion: The prevalence of intravitreal Bevacizumab use among patients undergoing retinal surgical procedures was observed to be comparatively lower than that reported in previous studies conducted in similar settings. Central Retinal Vein Occlusion (CRVO), Choroidal Neovascular Membrane, and Central Serous Retinopathy were the most prevalent retinal diseases requiring intravitreal Bevacizumab intervention.

Keywords: Bevacizumab; Intravitreal injection; Ocular surgery; Ophthalmology



How to Cite: Shrestha R, Thapa SC, Rajkarikar S, Dhakal S, Thapa K, Khadka S. Use of intravitreal bevacizumab among patients undergoing retinal surgical interventions in a military hospital: a descriptive cross-sectional study. *Journal of Patan Academy of Health Sciences*. 2024 Apr;11(1):39-43.

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Introduction

Bevacizumab is a humanized monoclonal antibody which acts against vascular endothelial growth factor A (VEGF-A) and suppresses microvascular growth and angiogenesis.¹ Its use has been shown to stabilize and improve vision for which its use has been expanded extensively in ophthalmology worldwide, including Nepal. Some patients require multiple doses for retinal pathologies. However, the number of patients receiving intravitreal Bevacizumab, the frequency of administration, and the demographic profile of patients receiving it have not been studied extensively in Nepal.

This study aims to study the profile of patients receiving intravitreal Bevacizumab, prevalence of its use, and indications for intravitreal Bevacizumab administration at a tertiary care hospital.

Method

This was a retrospective descriptive cross-sectional study done in Shree Birendra Hospital. The patients who underwent ocular surgeries from 14th April 2022 to 16th November 2023 were included in this study. Ethical clearance was obtained from the Institutional Review Committee of the Nepalese Army Institute of Health Sciences (Reg. No. 1004). The sample size was calculated using the formula,

$$\begin{aligned}
 n &= Z^2 \times p \times q / e^2 \\
 &= (1.96)^2 \times (0.5 \times 0.5) / 0.05^2 \\
 &= 0.9604 / 0.0025 \\
 &= 384
 \end{aligned}$$

Where,

n = minimum required sample size

Z = 1.96 at 95% Confidence Interval (CI)

p = prevalence 50% (for maximum sample size)

q = 1-p

e = margin of error, 5%

The minimum sample size calculation yielded a value of 384. However, a total of 1674 patients who underwent different ocular surgeries were included in the study. Patients who were diagnosed with retinal diseases, underwent surgery for retinal disease, and received intravitreal Bevacizumab were included in the study. Patients with incomplete medical records and data were excluded from the study.

For data collection, a study tool with structured questions was prepared and used. The study tool

had demographic data sections, indications, and characteristics of usage of Bevacizumab. The data collected were inputted into Microsoft Excel and analyzed using the Statistical Package for the Social Sciences (SPSS) version 20 to examine various variables and conduct statistical tests. Data analysis was carried out using descriptive statistical methods such as frequency and percentage.

Result

Out of 1674 different ocular surgeries, intravitreal Bevacizumab injections were used in 453(27.06%) at 95% CI (24.94-29.19) patients.

The age distribution of the patients revealed 53(11.70%) in the 30-49 age group, 232(51.22%) in the 50-69 age group, and 168(37.08%) above 70 years. Gender distribution showed 180(39.74%) males and 273(60.26%) females, Table 1.

Table 1. Socio-demographic characteristics of the patients (N=453)

Demographics	N(%)
Age group	
30-49	53(11.70%)
50-69	232(51.22%)
>70	168(37.08%)
Sex	
Male	180(39.74%)
Female	273(60.26%)
Location	
Kathmandu	61(13.47%)
Taplejung	44(9.71%)
Bhaktapur	35(7.73%)
Dhading	28(6.18%)
Gorkha	27(5.96%)
Dolakha	27(5.96%)
Others	231(50.99%)

Among the 453 cases analyzed, Central Retinal Vein Occlusion (CRVO) was the most prevalent indication for Intravitreal Bevacizumab use, constituting 249(54.97%) cases. Branch Retinal Vein Occlusion (BRVO) accounted for 98(21.64%), while Choroidal Neovascular Membrane (CNVM) and Central Serous Retinopathy (CSR) were observed in 40(8.83%) and 24(5.29%) cases, respectively. Diabetic Clinically Significant Macular Edema (CSME) and Proliferative Diabetic Retinopathy (PDR) were identified in 22(4.86%) and 18(3.97%) cases, respectively. Wet Age-Related Macular Degeneration (Wet ARMD) had the lowest prevalence, with 2(0.44%) cases, Table 2.

Table 2. Indications of intravitreal Bevacizumab use (N=453)

Indications	N(%)	Indications	N(%)
Central Retinal Vein Occlusion	249(54.97%)	Diabetic Clinically Significant Macular Edema	22(4.86%)
Branch Retinal Vein Occlusion	98(21.63%)	Proliferative Diabetic Retinopathy	18(3.97%)
Choroidal Neovascular Membrane	40(8.83%)	Wet Age-Related Macular Degeneration	2(0.44%)
Central Serous Retinopathy	24(5.29%)		

The utilization of Intravitreal Bevacizumab in the study was characterized by a predominant pattern of single-eye injections, accounting for 381(84.11%) patients. Both eyes received injections in 72(15.89%) cases. Regarding the frequency of usage, a significant portion received Intravitreal Bevacizumab once, Table 3.

Table 3. Characteristics of intravitreal Bevacizumab use (N=453)

Intravitreal Bevacizumab use	N(%)
Usage pattern	
Single eye injected	381(84.11%)
Both eyes injected	72(15.89%)
Frequency of usage	N(%)
Once	194(42.83%)
Twice	51(11.26%)
Thrice	19(4.19%)
More than three times	189(41.72%)

Discussion

A total of 1674 ocular surgeries were analysed, among which intravitreal Bevacizumab injections were used in 453(27.06%) patients. The most common indication for intravitreal Bevacizumab use was CRVO, observed in 249(54.97%) cases, followed by BRVO in 98(21.64%) cases. Vascular Endothelial Growth Factor (VEGF), a naturally occurring substance in the body, stimulates the growth of blood vessels, which can lead to leakage in retinal vessels.^{1,2} Bevacizumab, a monoclonal antibody targeting VEGF, effectively binds to and blocks all biologically active forms of VEGF, thereby inhibiting its function.³ Bevacizumab blocks VEGF and reduces vascular leakage and lessens the macular edema.^{4,5} The use of Bevacizumab has been approved for a spectrum of carcinoma but is also used for patients undergoing interventions for their retinal conditions.^{6,7} Evidence of positive outcomes for macular edema can be found in cases of uveitis, macular degeneration, diabetic retinopathy, CRVO and BRVO.⁸⁻¹¹ Moreover, its application has demonstrated prompt reduction of neovascularization in both the retina and iris in cases of proliferative disorders.¹²

The study conducted at Bascom Palmer Eye Institute revealed that bevacizumab is the predominant choice for ocular injections, being utilized in 72.12% of all injections.¹³ Intravitreal Bevacizumab emerges as an economically viable option, alleviating the financial burden associated with undergoing multiple injections. Our study found the utilization of Intravitreal Bevacizumab injections to be 27.06%, lower than a comparable study, where the use of intravitreal injections in ocular surgeries was reported at 30.86%.¹⁴

In our study, the predominant recipients of Intravitreal Bevacizumab were patients with CRVO, BRVO, and CNVM, mirroring findings in similar studies conducted in Nepal.^{14,15} Conversely, in other countries, Diabetes Mellitus (DM)-related indications take precedence, due to the higher incidence of diabetes in Western countries and an aging population.¹⁵⁻¹⁷ Consequently, DM-related indications are more prevalent in these regions.

Anoteworthy observation from our study is that 15.89% of patients received intravitreal Bevacizumab in both eyes, differing from a similar study which reported a higher percentage (29.19%) of patients receiving injections in both eyes.¹⁴ This could be because of differing number of single and both eyes' surgeries in two settings. Furthermore, our study highlighted that the majority of patients received Bevacizumab only once, in contrast to other studies reporting a mean number of injections exceeding two.^{18,19} Interestingly, a higher proportion of females received Bevacizumab in our study, contrary to findings in other studies where males outnumbered females.^{14,20} The majority of our patients fell within the age group of 50-69, aligning with the characteristic occurrence of Retinal Vein Occlusion (RVO) in older individuals, making Bevacizumab indications predominantly associated with RVO.

The strength of this study lies in its substantial sample size; however, it is essential to acknowledge the limitations, including the retrospective study design, the confinement to a single institution, and the use of convenience sampling methods.

Conclusion

The prevalence of intravitreal Bevacizumab use among patients undergoing retinal surgical procedures was observed to be comparatively lower than that reported in previous studies conducted in similar settings. The most frequent retinal diseases requiring intravitreal Bevacizumab were Retinal Vein Occlusion, Choroidal Neovascular Membrane, and Central Serous Retinopathy. Further researches are needed to comprehensively evaluate its efficacy and potential benefits in larger and more diverse patient populations.

Acknowledgment

None

Funding

None

Conflict of Interest

None

Author's contribution

Concept, design, planning: RS, STC, SR; Literature review: STC, SD, KT; Data collection: RS, STC, KT; Data analysis: STC, SK; Draft manuscript: RM, STC; Revision of draft: SR, SD, KT; Final manuscript: RM, STC, SR, SK; Accountability of the work: RS, SK

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