



## Prevalence of Neovascular Glaucoma in Retinal Diseases in a Tertiary eye care Centre of Bangladesh

Tajmeh Mehtaj<sup>1</sup>, Shams Mohammed Noman<sup>2</sup>, Golam Faruk Hossain<sup>3</sup>, Mohammad Mazharul Islam<sup>4</sup>

### Abstract

**Background:** Neovascular glaucoma (NVG) is a severe sight-threatening condition resulting from retinal ischemia, leading to neovascularization in the anterior segment of the eye. The burden of retinal diseases is particularly significant in low- and middle-income countries including Bangladesh due to limited access to early screening. **Aim:** To determine the prevalence of neovascular glaucoma in retinal diseases and assess its associated sociodemographic factors, visual status, and management practices among patients in a tertiary eye care center in Bangladesh.

**Result:** Among 38 respondents with retinal diseases, the prevalence of NVG was 97.4%, primarily linked to diabetic retinopathy 57.9% and central retinal vein occlusion 26.3%. Respondents had a mean age  $\pm$  SD is  $53.32 \pm 9.433$  years, with nearly equal gender distribution. Visual complaints were dominated by blurred vision, redness, and pain 71.1%. Comorbidities included diabetes 47.5% and hypertension 42.4%. Anterior segment findings highlighted iris neovascularization 78.9%, while posterior findings included hemorrhages 34.2% and macular edema 10.5%. Gonioscopy findings showed open angles in 63.2% and neovascularization in 28.9%. The most frequent intraocular pressure (IOP) reading status for the right eye was 35 mm of Hg, observed in 10.5% of cases, while the left eye had the highest frequency at 20 mm of Hg, occurring in 13.2% of cases. The post-surgical management of IOP in the cohort. A significant proportion, 34.2%, underwent post-surgical IOP monitoring, while 65.8% did not. Similarly, only 15.8% of patients received medications for IOP management post-surgery, indicating that the majority, 84.2%, did not require such intervention.

**Methods:** This cross-sectional study was conducted at Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh, from October 2022 to November 2024. Patients aged  $\geq 18$  years with retinal diseases were included, while those with unrelated glaucoma or incomplete data were excluded. Data were collected using a pre-tested questionnaire and detailed ophthalmological evaluations, including gonioscopy and visual acuity assessments. Statistical analyses were performed using Statistical Package for Social Sciences (SPSS) version 26.0. Findings were presented by frequency and percent table.

**Conclusion:** Neovascular glaucoma is highly prevalent among patients with retinal diseases, particularly those with diabetic retinopathy and retinal vein occlusion in Bangladesh. Early detection and comprehensive management are crucial to mitigating its impact and preventing blindness in resource-limited settings.

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## Introduction

Pathogenesis of Neovascular Glaucoma is a serious form of glaucoma indicated by the development of abnormal blood vessels in the eye, usually caused by retinal ischemia, important to raised intraocular pressure and potential vision loss. It is a severe form of secondary glaucoma categorized by the proliferation of new blood vessels on the iris and within the anterior chamber angle, frequently important to significant visual impairment. This condition characteristically arises from retinal ischemia related with diseases such as proliferative diabetic retinopathy (PDR) and central retinal vein occlusion (CRVO) [1].

In Bangladesh, the prevalence of glaucoma among persons aged 40 years and older is approximately 2.1%, with primary open-angle glaucoma being the most common procedure [2].

Exact data on the prevalence of NVG in the Bangladeshi residents remain inadequate. Given the rising incidence of diabetes and associated problems in the region, it is believable that the prevalence of NVG is also growing.

Studies from adjacent countries provide some perceptions. For example, research from India designates that the prevalence of NVG among patients with PDR can be as high as 21.3% [3]. Moreover, a hospital-based study stated that retinal vein occlusion accounted for 53% of NVG cases, followed by proliferative diabetic retinopathy at 41% [4].

Neovascular glaucoma is an upsetting difficulty of retinal ischemia, usually arising from complaints like proliferative diabetic retinopathy (PDR) or central retinal vein occlusion. It's characterized by the growth of new blood vessels in the iris and angle of the anterior chamber [5,6]. Though NVG accounts for a small proportion of all glaucoma cases worldwide, it significantly underwrites to blindness due to its rapid development and confrontation to conventional treatment [7].

In Bangladesh, the burden of retinal diseases is increasing in tandem with growing rates of diabetes and hypertension. A recent population-based study originates that diabetic retinopathy (DR) affects nearly 12% of persons with diabetes, with proliferative stages being a major contributor to NVG growth [8]. Despite this, there is incomplete complete data on the prevalence of NVG among patients with retinal diseases in the country. Understanding these tendencies is vital for the deterrence of permanent visual damage and blindness.

Data from India, a bordering country with similar healthcare contests, highlight the significant influence of NVG on patients with progressive retinal circumstances.

Studies have stated NVG prevalence rates of up to 18% in PDR cases and 20–30% in retinal vein occlusions [9]. Still, management consequences remain suboptimal due to late presentation and limited access to specialized care [10].

This study aims to determine the prevalence of NVG among patients with retinal diseases and to assess associated sociodemographic factors, visual status, and management practices in a tertiary eye care center in Bangladesh.

## Materials and Methods

This cross-sectional study was conducted at Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh, over a two-year period from October 2022 to November 2024. The study included patients aged 18 years and older diagnosed with retinal diseases and those with confirmed diagnoses of NVG or at risk of NVG due to underlying retinal conditions. Patients with incomplete clinical records, secondary glaucoma unrelated to neovascularization or retinal diseases, or those unwilling to provide informed consent were excluded. Ethical approval was obtained from the Institutional Review Board of BSMMU, and written informed consent was secured from all participants.

Data were collected using a pre-tested, semi-structured questionnaire that captured sociodemographic details, clinical history, visual status, and management practices. Data was analyzed by using SPSS software (version 26.0) and findings were presented by frequency and percent table. Comprehensive ophthalmological evaluations, including gonioscopy and visual acuity assessments using Snellen's chart, were conducted. Anterior and posterior segment findings were documented to identify features associated with NVG.

Descriptive statistics summarized categorical variables as frequencies and percentages, while continuous variables were expressed as means and standard deviations. Results are presented in tabular and graphical formats to ensure clarity and comprehensiveness.

## Results

Among the 38 respondents, the mean age was  $53.32 \pm 9.433$  years, ranging from 34 to over 65 years. Gender distribution was nearly equal, with 52.6% male and 47.4% female.

NVG was diagnosed in 97.4% of respondents. Diabetic retinopathy was the leading cause, accounting for 57.9% of cases, followed by central retinal vein occlusion 26.3%, old hemi-retinal vein occlusion 7.9%, and branch retinal vein occlusion 2.6%. Miscellaneous conditions were identified in 5.3% of cases.

The most frequent IOP reading for the right eye was 35 mm of Hg, observed in 10.5% of cases, while the left eye had

the highest frequency at 20 mm of Hg, occurring in 13.2% of cases.

The post-surgical management of intraocular pressure in the cohort. A significant proportion, 34.2%, underwent post-surgical IOP monitoring, while 65.8% did not. Similarly, only 15.8% of patients received medications for IOP management post-surgery, indicating that the majority, 84.2%, did not require such intervention.

Anterior segment findings showed iris neovascularization in 78.9% of cases, with flare, pupil reactivity, and surface abnormalities each reported in 5.3%. Posterior segment findings included hemorrhages along the disc or elsewhere in 34.2% of cases, macular edema in 10.5%, and retinal detachment in 10.5%.

Gonioscopy findings revealed that 63.2% of respondents had an open angle, while 15.8% had a closed angle with new vessel growth. New vessels in the angle were observed in 7.9%, and narrow angles with new vessels in 5.3%.

Visual acuity assessments revealed that 6/60 was the most common in the right eye 28.9% and the left eye 26.3%. Severe impairments, such as no perception of light (NPL), were noted in 15.8% of the right eyes and 2.6% of the left.

Management strategies were diverse, with 39.5% receiving conservative treatment, 28.9% undergoing surgical interventions, and 28.9% receiving a combination of both.

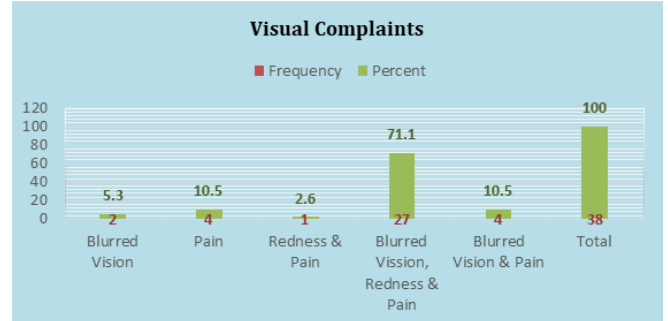
**Table 1:** Distribution of the respondents by Socio Demographic Variables.

Age	Frequency	Percent
34-44	5	13.2
45-54	17	44.7
55-64	12	31.6
65+	4	10.5
Total	38	100
Mean±SD	53.32±9.433	
<b>Gender</b>		
Male	20	52.6
Female	18	47.4
Total	38	100

Table 1. The age of the respondents ranged from 34 to 65 years and above, with a mean age of 53.32 ± 9.433 years. The majority 44.7% were aged between 45 and 54 years. The gender distribution was nearly equal, with 52.6% male and 47.4% female.

Figure 1 highlights the visual complaints reported by the 38 respondents. The majority (71.1%) experienced a

Figure 2 presents the majority 63.2% had an open angle, while 7.9% showed neo vessel growth. Other findings



**Figure 1:** Distribution of Respondents by Visual Complaints

combination of blurred vision, redness, and pain. Blurred vision and pain together were reported by 10.5%, while 5.3% had only blurred vision. Pain alone accounted for 10.5% of cases, and 2.6% reported redness and pain.

Table 2 shows the prevalence of comorbidities among respondents, considering both family and personal medical histories. In family history, 40% reported eye diseases and diabetes, 24% hypertension, with a total exceeding 100% due to multiple responses. For personal medical history, diabetes 47.5% was most common, followed by hypertension 42.4%, cardiovascular disease 8.5%, and other eye diseases 1.7%. Again, the total percentage exceeded 100% due to multiple comorbidities.

Table 3 summarizes the anterior and posterior segment findings among the 38 respondents. Most respondents 97.4% had a retinal disease, with diabetic retinopathy being the most prevalent 39.5%. Central retinal vein occlusion 28.9% was the second most common. Most respondents suffered for 1-3 years 84.2%. Anterior segment findings primarily included iris neovascularization at the margin 78.9%, while posterior segment findings were more diverse, with hemorrhages along with disc or elsewhere being the most common 34.2%.

Table 4 shows the diagnosis and underlying causes of neovascular glaucoma among 38 respondents. Almost 97.4% were diagnosed, while 2.6% were not. Diabetic retinopathy was the most common cause 57.9%, followed by central retinal vein occlusion 26.3%, old hemi-retinal vein occlusion 7.9%, branch retinal vein occlusion 2.6%, and other miscellaneous causes 5.3%.

Table 5 shows the prevalence and types of retinal diseases among 38 respondents. The vast majority, 97.4%, reported having a retinal disease. Diabetic retinopathy was the most prevalent at 39.5%, followed by central retinal vein occlusion 28.9%, old hemi-retinal vein occlusion 10.5%, retinal detachment 7.9%, and other 13.2%.

**Table 2:** Distribution of Respondents by Family and Personal History of Other Comorbidities.

Family History				Personal History			
Comorbidities	N	Percent	Percent of Cases	Comorbidities	N	Percent	Percent of Cases
Other disease	20	40.00%	87.00%	Other diseases	1	1.70%	2.70%
Diabetes	20	40.00%	87.00%	Diabetes	28	47.50%	75.70%
Hypertension	12	24.00%	52.20%	Hypertension	25	42.40%	67.60%
Total	50	100.00%	217.40%	Cardiovascular Disease	5	8.50%	13.50%
				<b>Total</b>	<b>59</b>	<b>100.00%</b>	<b>159.50%</b>

Dichotomy group tabulated at value 1. Multiple response.

**Table 3:** Distribution of Respondents by Anterior and Posterior Segment Findings.

Anterior Segment Findings	Frequency	Percent	Posterior Segment Findings	Frequency	Percent
Corneal Opacity	1	2.6	Macular Edema	4	10.5
Flare	2	5.3	Hemorrhages	1	2.6
Pupil Reactivity	2	5.3	Retinal Detachment	4	10.5
Iris Neovascularization margin	30	78.9	Disc or else where	8	21.1
Surface	2	5.3	Hemorrhages & Disc or else where	13	34.2
Anterior Chamber Cell, Flare, Pupil Reactivity & Iris Neovascularization margin	1	2.6	Macular Edema, Hemorrhages, Exudates & Disc or else where	1	2.6
			Exudates, Hemorrhages & Disc or else where	2	5.3
			Retinal Detachment & Disc or else where	2	5.3
			Hemorrhages, Retinal detachment & Disc or else where	1	2.6
			Other	2	5.3
<b>Total</b>	<b>38</b>	<b>100</b>	<b>Total</b>	<b>38</b>	<b>100</b>

**Table 4:** Diagnosis and Causes of Neovascular Glaucoma among Respondents.

Neo-vascular glaucoma diagnosed by healthcare professional	Frequency	Percent
Yes	37	97.4
No	1	2.6
<b>Total</b>	<b>38</b>	<b>100</b>
Cause of your neo-vascular glaucoma		
Diabetic Retinopathy	22	57.9
Central Retinal Vein Occlusion	10	26.3
Old Hemi retinal vein Occlusion	3	7.9
Other	2	5.3
Brach retinal vein occlusion	1	2.6
<b>Total</b>	<b>38</b>	<b>100</b>

**Table 5:** Distribution of types of Retinal Diseases among Respondents.

Any retinal diseases	Frequency	Percent
Yes	37	97.4
No	1	2.6
<b>Total</b>	<b>38</b>	<b>100</b>
Type of retinal disease		
Diabetic Retinopathy	15	39.5
Retinal Detachment	3	7.9
Central Retinal Vein Occlusion	11	28.9
Old Hemi retinal vein occlusion	4	10.5
Other	3	13.2
<b>Total</b>	<b>38</b>	<b>100</b>

**Table 6:** Distribution of Respondents by Visual Acuity in Right and Left Eyes.

Right Eye: (Snellen Chart Notation)	Frequency	Percent	Left Eye: (Snellen Chart Notation)	Frequency	Percent
Jun-60	11	28.9	Mar-60	1	2.6
Jun-36	4	10.5	Jun-60	10	26.3
6/00	2	5.3	CF1ft	3	7.9
06-Dec	2	5.3	06-Dec	5	13.2
Mar-60	2	5.3	Jun-36	2	5.3
NPL (No perception of Light)	6	15.8	Jun-18	3	7.9
CF1ft	2	5.3	Jun-24	2	5.3
Jun-18	2	5.3	CF2ft	1	2.6
CF2ft	3	7.9	Feb-60	1	2.6
CF3ft	3	7.9	CF3ft	3	7.9
			CF5ft	1	2.6
			Jun-90	3	7.9
			Apr-60	1	2.6
Hand Movement	1	2.6	Hand movement	1	2.6
			NPL	1	2.6
<b>Total</b>	<b>38</b>	<b>100</b>	<b>Total</b>	<b>38</b>	<b>100</b>

Table 6 shows the distribution of visual acuity for the right and left eyes of 38 respondents, based on Snellen Chart Notation. For the right eye, 6/60 was the most common acuity 28.9%, followed by NPL 15.8%. Other acuities like CF3ft, CF2ft, and Hand Movement were less frequent. For the left eye, 6/60 was also the most prevalent 26.3%, followed by 6/12 13.2% and 6/90 (7.9%). Other acuities like CF3ft and NPL were less common.

Table 7 presents the distribution of most recent readings for right and left eyes, measured in millimeters of Hg. Both eyes exhibited a range of readings, with the right eye showing a slightly wider range than the left. The most frequent reading for the right eye was 35 mm of Hg, observed in 10.5% of cases, while the left eye had the highest frequency at 20 mm of Hg, occurring in 13.2% of cases.

**Table 7:** Distribution of most recent intraocular pressure reading status of right and left eye.

Most recent reading status			Most recent reading status		
Right eye (mm of Hg)	Frequency	Percent	Left eye (mm of Hg)	Frequency	Percent
10	1	2.6	11	1	2.6
12	2	5.3	12	3	7.9
15	3	7.9	15	1	2.6
18	3	7.9	16	2	5.3
20	1	2.6	17	2	5.3
21	2	5.3	18	3	7.9
22	3	7.9	19	1	2.6
24	1	2.6	20	5	13.2
25	2	5.3	21	2	5.3

27	2	5.3	22	1	2.6
28	2	5.3	23	1	2.6
30	3	7.9	24	2	5.3
32	1	2.6	25	2	5.3
35	4	10.5	26	1	2.6
40	2	5.3	27	1	2.6
42	1	2.6	29	1	2.6
45	3	7.9	30	2	5.3
50	1	2.6	35	3	7.9
52	1	2.6	36	1	2.6
			40	1	2.6
<b>Total</b>	<b>38</b>	<b>100</b>	<b>45</b>	<b>2</b>	<b>5.3</b>
			<b>Total</b>	<b>38</b>	<b>100</b>

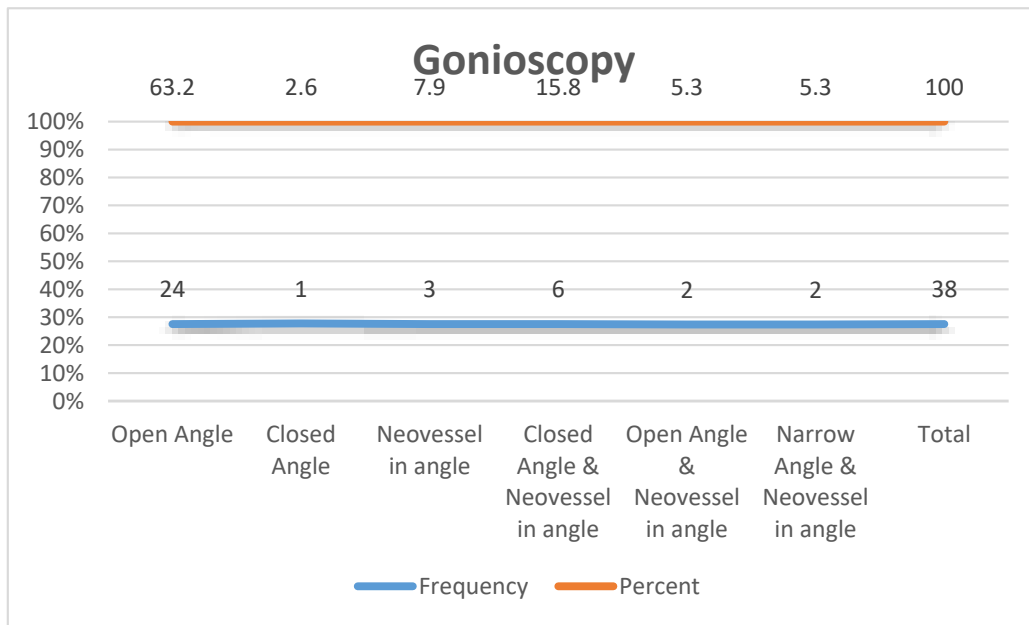


Figure 2: Distribution of Respondents by Gonioscopy Findings.

Table 8: Distribution of Respondents by type of Management.

Type of management	Frequency	Percent
Conservative (medications, lifestyle modifications)	15	39.5
Surgical	11	28.9
Both	11	28.9
N/A	1	2.6
<b>Total</b>	<b>38</b>	<b>100</b>

Table 9: Distribution of Post-Surgical Intraocular Pressure Monitoring and Medication Management.

Pressure Monitoring and Medication Management	Intraocular pressure measure since surgery		Medication for IOP management post-surgery	
	Frequency	Percent	Frequency	Percent
Yes	13	34.2	6	15.8
No	25	65.8	32	84.2
<b>Total</b>	<b>38</b>	<b>100</b>	<b>38</b>	<b>100</b>

included combinations of closed angle and neo vessel growth 15.8%, open angle with new vessels 5.3%, and narrow angle with new vessels 5.3%. Only 2.6% had a closed angle without additional findings.

Table 8 details regarding management, 39.5% were managed conservatively, 28.9% surgically, 28.9% received both, and 2.6% had no specific management.

Figure 3 displays the types of eye surgeries related to NVG's performed on 38 respondents. 57.9% did not undergo surgery. Among those who did, Ahmed valve implant and trabeculectomy with Mitomycin C (MMC) were the most common 10.5% each. Other procedures included trabeculectomy with various combinations and implants, as well as Diode laser cyclophotocoagulation (DLCP).

Table 9 summarizes the post-surgical management of IOP in a cohort of 38 patients. A significant proportion, 34.2%, underwent post-surgical IOP monitoring, while 65.8% did not. Similarly, only 15.8% of patients received medications for IOP management post-surgery, indicating that the majority 84.2% did not require such intervention.

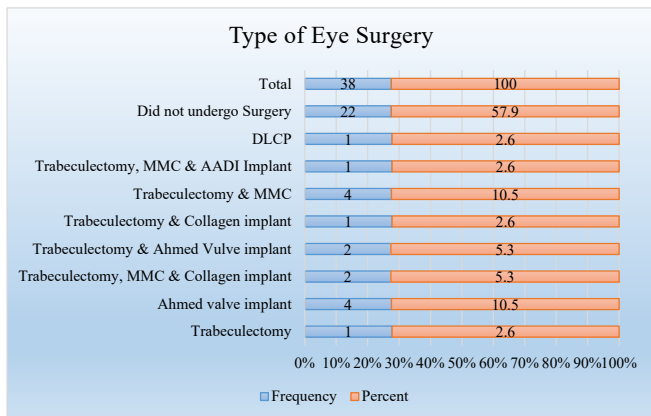


Figure 3: Distribution of Respondents by Type of Eye Surgery related to NVG.

## Discussion

This study investigated the prevalence of neovascular glaucoma among patients with retinal diseases at a tertiary eye care center in Bangladesh. The findings revealed a remarkably high prevalence of NVG 97.4%, underscoring the significant burden of this sight-threatening condition in this population. This study aligns with previous studies conducted in developing countries, which have similarly reported high NVG prevalence among patients with retinal diseases [5]

The high prevalence of diabetic retinopathy 57.9% as the causing of NVG is uniform with the rising incidence of diabetes in Bangladesh [6] and its well-established correlation with NVG development [7]. The predominance of NVG in

patients with DR 57.9% mirrors current literature, which identifies proliferative PDR as a major risk factor for NVG due to ischemia-induced angiogenesis [8; 11]. Likewise, CRVO accounted for 26.3% of cases, reliable with Indian studies that characteristic a significant percentage of NVG cases to retinal vein occlusion [12]. These data highlight the importance of addressing complete comorbidities like diabetes and hypertension, which were prevalent in 47.5% and 42.4% of respondents, consistently, and are known to worsen retinal vascular circumstances.

Visual acuity assessments exposed severe damage in many patients, with 15.8% of right eyes showing NPL. These findings focus on the overwhelming impact of NVG on vision and excellence of life. Prior studies have equally recognized high rates of vision loss in NVG, mainly in patients awarding late or with progressive disease [10; 13].

Management strategies for NVG in this cohort diverse, with 39.5% receipt conservative treatment and 28.9% undergoing surgical interventions. The difficulty of NVG needs a multimodal method, frequently combination medical therapy, laser treatment, and surgery. Current progressions in anti-VEGF therapies and minimally invasive glaucoma surgeries (MIGS) have prolonged treatment choices, contribution possible assistances in governing intraocular pressure and neovascularization [14].

The considerable prevalence of NVG amongst patients with retinal diseases in Bangladesh underlines the necessity for improved screening and management protocols. Applying monotonous ophthalmic evaluations for persons with DR and CRVO, attached with timely therapeutic interventions, could mitigate the development to NVG. Public health initiatives concentrating on the management of systemic risk issues, such as diabetes and hypertension, are also authoritative in dropping the incidence of NVG [15].

The study also highlighted the significant visual impairment experienced by patients. Visual acuity ranged from 6/60 to no light perception, emphasizing the severe impact of NVG on vision. This aligns with the known pathophysiology of NVG, where improved IOP and retinal ischemia can lead to irreversible vision loss [16].

## Conclusion

The results highlight the critical requirement for complete strategies to address NVG in patients with retinal diseases in Bangladesh. Initial discovery, rapid intervention, and actual management of systemic comorbidities are important to stop vision loss and recover patient outcomes. Collective efforts between healthcare providers and policymakers are essential to improve access to progressive therapies and implement public health actions aimed at dropping the burden of NVG.

## Declaration of Interest Statement:

The authors report no conflict of interest.

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