



BMJ Open Ophthalmologists' and patients' perspectives on treatments for diabetic retinopathy and maculopathy in Vietnam: a descriptive qualitative study

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ABSTRACT

Introduction Globally, diabetic retinopathy (DR) is the leading cause of blindness in working-aged adults. Early detection and treatment of DR is essential for preventing sight loss. Services must be available, accessible and acceptable to patients if we are to ensure they seek such care.

Objectives To understand patients' knowledge and attitudes towards laser versus anti-vascular endothelial growth factor (VEGF) injections to treat DR in Vietnam, and to identify factors Vietnamese ophthalmologists consider when making treatment decisions.

Methods This is a descriptive qualitative study based on semi-structured interviews with 18 patients (12 from Ho Chi Minh City and 6 from Hanoi) plus individual interviews with 24 ophthalmologists working in eye clinics in these cities. Thematic analysis was used to analyse the data.

Results In total, 10/24 (41.7%) ophthalmologists were female, and their median age was 41 years (range 29–69 years). The median age of patients was 56.5 years (range 28–72 years), and 7/18 (38.9%) were female. Briefly, factors that influence DR treatment decisions for ophthalmologists are medical considerations (ie, severity of disease, benefits and risks), availability (ie, treatment and resources) and patient-related factors (ie, costs and adherence). Patient's perceived barriers and facilitators to treatments were based on patient and family related factors (ie, treatment and transportation costs) and previous treatment experiences (ie, positive and negative). Recommendations by all participants included ensuring that both laser and anti-VEGF injections are widely available across the country and controlling costs for patients and the healthcare system.

Conclusions Reducing DR treatment costs, optimising treatments options, and expanding the network of clinics offering treatment outside metropolitan areas were the main issues raised by participants. These findings can help inform policy changes in Vietnam and may be generalisable to other low-resource settings.

INTRODUCTION

Globally, the number of adults with diabetes mellitus (DM) increased nearly threefold

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ This descriptive qualitative study considered and integrated both user and provider perspectives.
- ⇒ An experienced qualitative researcher was involved in data collection and analysis.
- ⇒ Data were collected by two different interview teams, increasing the risk of interviewer and response bias.

from 151 million in 2000 to 537 million today, and this figure is predicted to increase to 783 million by 2045.¹ Seventy-five per cent of adults with DM live in low-income and middle-income countries (LMICs).¹ Diabetic retinopathy (DR), including diabetic macular oedema (DMO), is one of the leading causes of blindness among working-age people with DM.² Early detection and timely treatment of DR can reduce vision loss by approximately 95%.^{3,4}

Laser photocoagulation has been considered the mainstream treatment for sight-threatening DR (STDR) over the past few decades because it can reduce the risk of visual loss.^{5,6} However, intravitreal anti-vascular endothelial growth factor (VEGF) treatments plus laser can effectively preserve and restore vision.⁷ Furthermore, anti-VEGF injections can substantially improve visual outcomes for patients with clinically significant macular oedema^{8–10} with repeated injection treatment provided until the macula is dry or until vision can no longer be improved.¹¹ Anti-VEGF injections offer better outcomes for patients with DMO but can be expensive, and their frequent administration can be burdensome for patients who often travel long distances to reach treatment clinics.^{12–14}

Patients in LMICs face difficulties accessing injections largely because of limited access to and higher cost of anti-VEGF medications compared with their availability in industrialised nations.¹⁵ Further obstacles include potential harm to patients and the lack of skilled personnel to deliver the treatment, plus inconsistent follow-up and management of STDR.¹⁵

Advantages of laser treatment in LMICs include the lower cost for patients and greater treatment adherence because of the less demanding follow-up schedules compared with anti-VEGF injections.¹⁶ Lasers have lower running costs so are a more economical option for hospitals and eye clinics; however, the initial high cost of purchasing laser equipment can be prohibitive.¹⁶

Lack of access to eye care services in LMICs is a widespread problem. Factors that commonly affect patients' attendance include socioeconomic status, gender, cultural factors and perceived costs of treatments.⁴ People with pre-existing conditions or disabilities face greater challenges in accessing eye care compared with those without, and patients with lower socioeconomic status or poor eye health literacy are less likely to adhere to eye care services.^{17 18} How countries organise funds and pay for health services affect the availability, accessibility and affordability of different treatments for DR. In particular, ophthalmologists are in short supply in low-resource settings and training facilities are often lacking or suboptimal.^{19 20}

Vietnam is one of the largest countries in Asia that is affected by the significant rises in DM. The prevalence of DM among adults aged 20–79 years is 5.76% and this has almost doubled over the past 10 years.^{21 22} To prevent DM-related complications such as DR, diabetic eye screening programmes are being pilot tested in Vietnam, therefore, access to affordable and safe DR treatments is essential. To date, there is a lack of research on patient and ophthalmologists' attitudes towards laser and anti-VEGF injections for STDR in Vietnam. This study seeks to better understand patients' and ophthalmologists' perspectives in order to improve patient care and service provision in Vietnam.

METHODS

Study design and setting

This is a descriptive qualitative study. Participants were chosen from two major cities in Vietnam to capture variation between the two contexts. All invited ophthalmologists (n=24) working in an eye hospital in Hanoi or Ho Chi Minh City (HCMC) agreed to join the study and were recruited by an invitation letter from their department head. Semi-structured interviews were also conducted with 18 patients requiring treatment for STDR, 12 from HCMC and 6 from Hanoi. Purposeful sampling was used to select patients from relevant lists at two secondary eye care hospitals offering DR treatment services. Sampling stopped once data saturation was reached, and no new themes were identified (see online

supplemental additional file 1 for inclusion criteria of study participants).

Data collection

English language, semi-structured interview guides were developed based on the literature plus clinical experience of the research team members (online supplemental additional files 2 and 3). The guides were back translated by two bilingual team members and pilot tested, resulting in minor changes. Interviews were conducted in Vietnamese from March to July 2018 by a team of public health researchers trained by an experienced qualitative researcher from Queen's University Belfast (QUB) (LL).

Data analysis

Interviews were audio recorded using an MP3 recorder, with participants' permission and transcribed in the original language (Vietnamese). The transcripts were then translated to English by bilingual team members of the Vietnamese office of Orbis International, a non-government organisation dedicated to preserve the sight of people in low-resource settings. All identifying information was removed prior to submitting the transcripts for analysis.

This study followed the steps proposed by Braun and Clarke for thematic analysis.²³ Initially, three researchers (medical anthropologist (LL), monitoring, evaluation and learning manager (VTN) and research fellow (KC)) read and re-read transcripts in order to familiarise themselves with the data. The second level of analysis involved two authors (KC, LL) generating initial codes. The authors developed and modified the codes as they worked through the coding process. The third stage involved the authors searching for new themes (ie, patterns in the data that are significant and interesting), identifying quotes that were congruent with the overarching themes (inductive analysis). Themes were also created based on the literature and interview guides (deductive analysis). The authors reviewed all themes prior to defining and naming them, and once consensus was reached between authors, the authors (KC, LL) proceeded to write the results. This was all carried out manually using Microsoft Word (Microsoft, Redmond, Washington, USA).

Rigour

Rigour in qualitative terms is a way to establish trust or confidence in data collection, analysis and interpretation of a research study. Steps to increase rigour included developing and following a peer-reviewed research protocol and interview guide, asking participants to verify their answers during interviews, peer examination by qualitative researchers, maintaining an audit trail and researcher triangulation across research team members. The Standards for Reporting Qualitative Research criteria were used to assess rigour and completeness of the study.²⁴

Patient and public involvement

Patients were involved.

Findings

To clearly distinguish between researcher's and participant's views, quotes are in italics and tagged with a unique ID number: MD1-12 are Hanoi-based ophthalmologists; MD13-24 are those based in HCMC; S_PT01-S_PT12 are from HCMC (in the south) and N_PT01-N_PT06 are the patients from Hanoi (in the north). Quotes were lightly edited to increase readability while retaining their original meaning; ellipses (...) show where words were removed and [text] indicates where they were added.

Demographics

In total, 10/24 (41.7%) ophthalmologists were female, half of the sample worked in Hanoi and the other half in HCMC, and their median age was 41 years (range 29–69 years). On average, the ophthalmologists had worked for 17.4 years in ophthalmology (range 5–44 years) and 12.8 years as DR specialists (range 4–32 years). Twelve of the 18 patients were from HCMC and 6 were from Hanoi. Overall, an equal proportion (50%) of patients were compliant to their DR treatment (ie, compliance was defined as failure to miss more than one appointment in the last 12 months and this was obtained from the patient's health records); however, more patients in Hanoi were compliant to treatment (4/6 or 66.7%) compared with those in HCMC (5/12 or 41.7%). The median age of patients was 56.5 years (range 28–72 years), and 7/18 (38.9%) were female.

Two major themes were identified from the ophthalmologists' data including factors that influence ophthalmologists DR treatment decisions and their recommendations for improving DR care in people at risk or with DR. Three major themes related to patient perspectives were developed, including patient knowledge of DR and their preferences in making treatment decisions, perceived barriers and facilities to DR treatments, and recommendations for improving care in people at risk or with DR.

Ophthalmologists' perspectives

Theme 1: factors that influence ophthalmologists' DR treatment decisions

Three common factors that influenced ophthalmologists' choices were: medical considerations (ie, severity of disease, benefits and risks), availability (ie, treatment and resources) and patient-related factors (ie, costs and adherence). Ophthalmologists explained that they try to match each patient's condition to what they consider to be the best treatment option, *'Depending on the disease, we will choose the most appropriate method'* (MD5). For many of them, this meant treating DMO with injections and severe non-proliferative and proliferative DR (PDR) with laser, *'For severe non-proliferative diabetic retinopathy patients, I choose the laser method'* (MD21). Other ophthalmologists reported, *'If the patient presented with macular edema, I would 100% counsel towards injection treatment'* (MD19). In some cases, treatment starts with injections and progresses to using laser, *'In severe cases when the injection does not work, the patient needs to be treated further by laser'* (MD22). According

to ophthalmologists, injections can improve vision for patients with DMO and are generally safe, *'For injections, there are normally no complaints [from patients]'* (MD18). Reported risks and side effects of injection treatment include pain, intraocular inflammation and systemic conditions. The main benefits of laser for PDR as cited by ophthalmologists were the long-term reduction in risk of vision loss (*'Laser has good results; it stops loss of vision'* (MD17)), whereas risks include reduced visual field and pain, *'Laser patients often complain about pain after treatment'* [MD15], *'Laser can damage the visual field'* (MD9) (online supplemental additional file 4).

Patient-related factors such as ability to pay, distance to clinics and lost earnings influence ophthalmologists' decisions because they affect patients' ability to adhere to a complete course of treatments. More visits are required for injections than laser treatment therefore, ophthalmologists often selected laser as the treatment of choice, *'I will choose laser for the patients who live far away [from the hospital], or [those who do] not have good economic conditions and who cannot come for a [follow-up appointment]'* (MD5). Cost of treatment is also a major consideration for deciding on laser or injection treatment in Vietnam. One ophthalmologist from Hanoi mentioned that there was no huge financial cost of laser treatment to the patient, *'Avastin [bevacizumab] injection treatment costs about 1–1.5 million [Vietnamese dong (£33–47)]; Lucentis [ranibizumab] injection treatment costs about 13 million [£405] and laser costs 1–2 million [£33–66], depending on the insurance [coverage]'* (MD17) (online supplemental additional file 4).

Availability of drugs or equipment also influences ophthalmologists' decisions. Laser equipment is available in most hospital settings but occasionally this equipment is suboptimal or needs updating. In cases where laser is not available, particularly in rural clinics, patients must be transferred to other departments. More recently, anti-VEGF injections have become available, however, laser is more widely available, *'In my hospital, we do not offer injections because there is no operating room. But we have laser machines, so we can do laser for patients'* (MD11). Avastin is a cheaper alternative to Lucentis injections but remains an off-label drug, *'I want to use Avastin, but it is an off-label drug'* (MD09). This restricts injection use in Vietnam, especially for patients who cannot afford them (online supplemental additional file 4).

Theme 2: recommendations for improving care for people at risk or with DR

The main recommendations included expanding treatment options and controlling treatment costs. Investing in new generation lasers and providing multiple Food and Drug Administration-approved anti-VEGF therapies, ensuring they were cost-effective for patients was highlighted as a key recommendation. Officially endorsing Avastin for ophthalmic use in Vietnam so costs could be partially covered under the national insurance scheme as is done in other LMICs was recommended, *'In Thailand, a*

country with a similar economic status to Vietnam, the Ministry of Public Health has accepted Avastin as an official drug for DMO treatment, [paving the way for insurance coverage]. This is also a step to reduce the economic burden for blindness prevention' (MD01). Several ophthalmologists also suggested supporting education and training, particularly for doctors in provincial-level facilities. Some also recommended training nurses to give ocular injections to patients who have STDR, 'The burden of treatment should be shared with nurses... [which means we must provide] better education for them' (MD13). Furthermore, improving screening could help to detect the disease early and provide patients with better visual prognosis; 'If we detect early, we can control it easily with low-cost, highly efficient treatment and maintain long-term vision' (MD3) (online supplemental additional file 4).

Patients' perspectives

Theme 1: patient knowledge of DR and factors that influence their treatment decisions

Most patients were aware of their diabetes diagnosis, however, had limited knowledge of diabetes complications such as DR and the associated treatments. Patients sometimes became aware of DR and treatments during consultations with their doctors, while a few learnt from information resources such as newspapers and the internet. It was clear from interviews that patients rely heavily on ophthalmologists' treatment decisions to optimise their care, rather than selecting the best treatment option for themselves, 'I must follow the doctor's advice' (S_PT10), '[The doctor] said go for laser treatment so I went for laser' (S_PT04) (online supplemental additional file 5).

Theme 2: perceived barriers and facilitators to DR treatments

Patient-related factors such as treatment and transportation costs can influence adherence to treatments. One patient reported, 'the doctor said to take the injection, but I can't because the price is too high, so after the check-up that day I did not come back to see the doctor' (S_PT03). Another reported, 'the cost of transportation is expensive, so I did not go [back for treatment]' (S_PT06). Family related factors such as ability to bring patients to healthcare appointments can also influence treatment adherence, 'the travelling distance is far, and no one is going to take me there' (S_PT08) (online supplemental additional file 5).

Another aspect of theme 2 was patients' positive and negative experiences with previous treatment. Several patients reported positive interactions with doctors during previous appointments for treatment, which encouraged them to attend follow-up appointments, 'The doctor is very dedicated' (N_PT04). 'The doctor is also very enthusiastic' (N_PT02). Alternatively, negative experiences with doctors ('During the injection process, the doctor is quite hot-tempered' (S_PT04)) and side effects of treatment ('At the beginning of the injection, it is not painful, but after that, the pain is not imaginable' (N_PT04)) discouraged patients from completing recommended series of treatments.

Theme 3: recommendations for improving care for people at risk or with DR

The main recommendations were control treatment costs, diagnose and treat early and expand treatment options. We recognise there is considerable overlap between the patients' and ophthalmologists' perspectives with regard to future recommendations. Reducing treatment costs was the main recommendation made by patients, ('I hope that the cost of treatment will become cheaper so that more people can afford to have their disease cured' (S_PT02)). Other suggestions were to reduce travel costs by offering treatment in smaller clinics located outside central areas, 'I told the doctor that if he can cure me, I would not have to [travel] to Hanoi' (N_PT05)). Some patients hope for more modern technologies ('I just want the hospital to have more modern technologies so that we would get the best treatment for our eyes' (N_PT06)), while others advised seeking doctors' advice early, taking all the prescribed medications and accepting DR treatments to prevent visual impairment and blindness, 'People who have diabetes should go to the doctor early and get timely treatment' (S_PT09) (online supplemental additional file 5).

DISCUSSION

The current study identified patients' and ophthalmologists' views on laser and anti-VEGF injections for STDR in Vietnam, including major barriers to completing DR treatments in both Hanoi and HCMC. Documenting how ophthalmologists in LMICs make treatment decisions about DR is also vital to improving patient outcomes. The ophthalmologist's primary concern is to improve visual outcomes and prevent sight loss for people with STDR in Vietnam; however, treatment adherence is often based on a patient's ability to pay for a full course of treatment.

Comparably, patients in Vietnam frequently reported that high costs of treatment, transportation costs and distance to clinics were their main barriers to accepting treatment. This is consistent with findings from the 'World Report on Vision', where direct and indirect costs, income levels and health insurance status influence affordability to eye care services.⁴ Transport costs (indirect out-of-pocket costs) have been reported as a key barrier to accessing eye care services, particularly in LMICs. Approximately half of all people in LMICs live >1 hour away from the closest eye clinic offering treatment, making it more challenging for them to attend their appointments.¹⁴ Other indirect costs include the loss of productivity and earnings are also problematic for patients with eye conditions, particularly working-aged adults affected by DR.^{25 26}

Strengths

This study successfully identified patients' and ophthalmologists' perspectives towards DR treatment decisions and provided recommendations on how to improve patient outcomes and strengthen DR

treatment services for the future. The study followed a peer-reviewed protocol and interviewers were trained to ensure high-quality data were collected. To date, there is limited research available on patient and provider views regarding laser and anti-VEGF injections for STDR, particularly in low-resource settings. To our knowledge, this is the first such study to be conducted in Vietnam and the findings will be informative for the Vietnamese government and other LMICs, helping to inform policy changes for the future.

Limitations

Although the QUB research team was involved in the study design and data analysis, specially trained Vietnamese researchers conducted interviews to avoid language barriers and develop a clear understanding of patients' and ophthalmologists' views on DR treatments in Vietnam. Data were collected by two different interview teams, increasing the risk of interviewer and response bias. However, no marked differences were identified in terms of response patterns from participants in the north and the south. Transcripts were translated and cleaned (checked against audio files) by the Vietnamese team members, with no additional checks made on the accuracy of transcripts prior to their being analysed.

Recommendations for Vietnam

The main recommendation made by study participants (both ophthalmologists and patients) was to reduce treatment costs to ensure high-quality care can be delivered to more patients with STDR. In Vietnam, DR treatment is provided in major central hospitals in Hanoi and HCMC rather than in provincial and district hospitals. Offering services in these regions would increase treatment coverage and lower out-of-pocket cost for patients with STDR. However, additional skilled human resources are needed to treat these patients. Building capacity for human resources and facilities is recommended to expand DR treatment services. In the UK and other industrialised nations, specially trained ophthalmic nurses provide intravitreal injections for patients.^{27 28} Such task-shifting/sharing responsibilities are increasingly common across the globe for many aspects of healthcare, and could work well in Vietnam for treating STDR.²⁹

Conclusions

Anti-VEGF injections and laser are the DR treatments of choice in Vietnam. Ophthalmologists in Vietnam often choose laser as an alternative to injections due to availability, lower costs and better patient adherence stemming from needing fewer follow-up treatment appointments. Anti-VEGF treatments are preferred because of their ability to improve vision, particularly with DMO; however, are not as widely available as laser in Vietnam. Monitoring the impact of anti-VEGF injections can be difficult without the use of highly specialised equipment such as optical coherence tomography. Such technology is expensive; therefore, balancing sustainability and scalability is

crucial to the delivery of eye care at an international level. It is also important to understand the rate of infection of anti-VEGF injections after multiple treatments in low-resource areas. Furthermore, understanding the relative cost-effectiveness of such treatments in LMICs is essential, where assumptions on the cost of physician time and levels of patient compliance, crucial for modelling, may differ from what has been observed in high-income countries.

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REFERENCES

- International Diabetes Federation. *IDF diabetes atlas*. 10th edn, 2021. <https://diabetesatlas.org/en/>
- Cheung N, Mitchell P, Wong TY. Diabetic retinopathy. *Lancet* 2010;376:124–36.
- Lee R, Wong TY, Sabanayagam C. Epidemiology of diabetic retinopathy, diabetic macular edema and related vision loss. *Eye Vis* 2015;2:1–25.
- World Health Organisation. World report on vision, 2019. Available: <https://www.who.int/publications/i/item/world-report-on-vision> [Accessed 30 Jan 2021].
- Early Treatment Diabetic Retinopathy Study (ETDRS). Photocoagulation for diabetic macular edema. *Arch Ophthalmol* 1985;103.
- Moutray T JE, Lois N, Dj A. Different lasers and techniques for proliferative diabetic retinopathy (review). *Cochrane Libr* 2018;3:107.
- Mitchell P, Bandello F, Schmidt-Erfurth U, et al. The restore study: ranibizumab monotherapy or combined with laser versus laser monotherapy for diabetic macular edema. *Ophthalmology* 2011;118:615–25.
- Levy J. A review of anti-VEGF agents for proliferative diabetic retinopathy. *Eye* 2014;24:510–20.
- Stewart MW. Anti-VEGF therapy for diabetic macular edema. *Curr Diab Rep* 2014;14:510.
- Michaelides M, Kaines A, Hamilton RD, et al. A prospective randomized trial of intravitreal bevacizumab or laser therapy in the management of diabetic macular edema (bolt study) 12-month data: report 2. *Ophthalmology* 2010;117:1078–86.
- Ghanchi F, Bailey C, Chakravarthy U, Diabetic Retinopathy Guidelines Working Group. The Royal College of ophthalmologists' clinical guidelines for diabetic retinopathy: a summary. *Eye* 2013;27:285–7.
- Hall J. Impact of injection therapy on retinal patients with diabetic macular edema or retinal vein occlusion. *Clin Ophthalmol* 2016;10:1631–2.
- Virgili G, Parravano M, Evans JR, et al. Anti-vascular endothelial growth factor for diabetic macular oedema: a network meta-analysis. *Cochrane Database Syst Rev* 2018;246.
- Weiss DJ, Nelson A, Gibson HS, et al. A global map of travel time to cities to assess inequalities in accessibility in 2015. *Nature* 2018;553:333–6.
- Yorston D. Anti-VEGF drugs in the prevention of blindness. *Community Eye Health* 2014;27:44–6.
- Lin J, Chang JS, Smiddy WE. Cost evaluation of panretinal photocoagulation versus intravitreal ranibizumab for proliferative diabetic retinopathy. *Ophthalmology* 2016;123:1912–8.
- Fotouhi A, Hashemi H, Mohammad K. Eye care utilization patterns in Tehran population: a population based cross-sectional study. *BMC Ophthalmol* 2006;6:1–5.
- Marella M, Smith F, Hilfi L. Factors influencing disability inclusion in general eye health services in Bandung, Indonesia: a qualitative study. *Int J Environ Res Public Health* 2019;16.
- Le D-C KT, Fujino Y, Pham T-M. Health care system in Vietnam: current situation and challenges. *Asian Pacific J Dis Manag* 2010;4:23–30.
- Blanchet K, Gilbert C, de Savigny D. Rethinking eye health systems to achieve universal coverage: the role of research. *Br J Ophthalmol* 2014;98:1325–8.
- World Health Organisation. The growing burden of diabetes in Viet Nam [online], 2016. Available: <https://www.who.int/vietnam/news/feature-stories/detail/the-growing-burden-of-diabetes-in-viet-nam> [Accessed 30 Apr 2020].
- Khue NT. Diabetes in Vietnam. *Ann Glob Health* 2015;81:870–3.
- Braun V, Clarke V. Using thematic analysis in psychology. *Qual Res Psychol* 2006;3:77–101.
- O'Brien BC, Harris IB, Beckman TJ, et al. Standards for reporting qualitative research: a synthesis of recommendations. *Acad Med* 2014;89:1245–51.
- Mtuya C, Cleland CR, Philippin H, et al. Reasons for poor follow-up of diabetic retinopathy patients after screening in Tanzania: a cross-sectional study. *BMC Ophthalmol* 2016;16:1–7.
- Melese M, Alemayehu W, Friedlander E, et al. Indirect costs associated with accessing eye care services as a barrier to service use in Ethiopia. *Trop Med Int Health* 2004;9:426–31.
- Mclauchlan BYR, Balaskas K, Armstrong D. Intravitreal injections delivered by ophthalmic clinical nurse specialists. *Eye News* 2015;22:3.
- Varma D, Lunt D, Johnson P, et al. A novel approach to expanding the role of nurses to deliver intravitreal injections for patients with age-related macular degeneration. *Int J Ophth Pract* 2013;4:68–74.
- World Health Organisation. Task shifting to tackle health worker shortages [online], 2007. Available: https://www.who.int/healthsystems/task_shifting/TTR_tackle.pdf?ua=1 [Accessed 28 Dec 2021].