Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol.6 No. 12 (2025): December 2025 Issue
https://doi.org/10.51168/sjhrafrica.v6i12.2341
Original Article

Pattern of ocular manifestations in patients with systemic hypertension and diabetes mellitus: a descriptive observational cross-sectional study.

Dr. Varikuppala Mounika [1]
[1]*Civil Assistant Surgeon Specialist, Department of Ophthalmology, Area Hospital Thirumalayapalem, Khammam, Telangana, India*

Abstract

Background:

Systemic hypertension and diabetes mellitus frequently coexist and can produce retinal and lenticular changes that threaten vision. Clinic-based descriptions of the local burden help prioritize screening and early referral.

Objectives:

To describe the spectrum of ocular manifestations among adults with systemic hypertension and/or diabetes mellitus presenting to a secondary-care hospital, and to summarize retinopathy severity and patterns by disease duration.

Methods:

This descriptive observational study was conducted on fifty adults with documented hypertension and/or diabetes who underwent anterior-segment evaluation and dilated fundus examination. Ocular findings were recorded, and retinopathy was graded using standard clinical criteria.

Results:

The mean age was 56.8 ± 9.4 years, and 56% were men. Hypertension alone and combined hypertension–diabetes each accounted for 36% of participants, while diabetes alone accounted for 28%. Hypertensive retinopathy (44%), diabetic retinopathy (40%), and cataract (36%) were the leading findings, and 18% had a normal fundus. Diabetic macular edema was documented in 12%. Among 42 eyes with retinopathy, mild non-proliferative changes predominated (42.9%), followed by moderate (33.3%), severe non-proliferative (14.3%), and proliferative retinopathy (9.5%). Fundus abnormalities were more frequent in participants with systemic disease duration >10 years (83.3%) than in those with duration ≤5 years (52.4%).

Conclusion:

Ocular involvement was common in adults with hypertension and/or diabetes in this secondary-care setting, with retinopathy and cataract comprising the dominant clinical workload. Strengthening opportunistic screening and timely referral can improve the detection of vision-threatening disease.

Recommendations:

Integrate BP–diabetes eye screening into outpatient workflows, counsel patients on control targets, and establish a fast-track referral pathway for suspected macular edema or proliferative changes.

Keywords: *Hypertension; Diabetes mellitus; Hypertensive retinopathy; Diabetic retinopathy; Diabetic macular edema; Cataract*
Submitted: *November 07, 2025* ***Accepted:*** *December 08, 2025* ***Published:*** *December 31, 2025*
Corresponding author: *Dr. Varikuppala Mounika*
Email: ***mounikaallivelu@gmail.com***
CAS Specialist, Department of Ophthalmology, Area Hospital Thirumalayapalem, Khammam, Telangana, India

Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol.6 No. 12 (2025): December 2025 Issue
https://doi.org/10.51168/sjhrafrica.v6i12.2341
Original Article

Introduction

Systemic hypertension and diabetes mellitus (DM) are highly prevalent chronic disorders that frequently coexist and contribute to a shared spectrum of microvascular and macrovascular complications. The eye is a clinically accessible end-organ: retinal microvasculature can be examined directly, and anterior-segment changes such as cataract can be detected with basic equipment. The retina provides a unique, non-invasive window to evaluate microvascular injury, and retinal vascular changes can reflect cumulative exposure to elevated blood pressure and metabolic dysregulation [1,2]. From a public-health perspective, visual impairment reduces productivity and quality of life, while late presentation increases the need for costly interventions. In routine services, fundus changes are often detected opportunistically during evaluation for headache, blurring of vision, or as part of screening for systemic disease, highlighting the importance of structured eye assessment in medical clinics.

Hypertensive retinopathy encompasses arteriolar narrowing, arteriovenous (AV) crossing changes, retinal hemorrhages, cotton-wool spots, and, in advanced stages, optic disc edema. These signs correlate with systemic vascular damage and have been linked to cerebrovascular risk beyond office blood pressure measurements [1,4]. Standardized assessment improves consistency and facilitates communication between physicians and ophthalmologists [2,3].

Diabetic retinopathy (DR) remains a leading cause of preventable visual impairment in working-age adults. Global estimates show a substantial burden of DR and highlight that disease duration and poor metabolic control are key drivers of progression [5]. Clinical severity scales provide a common language for grading DR and diabetic macular edema (DME), which is an important cause of central vision loss [6]. Landmark trials have demonstrated that improved glycemic control and comprehensive cardiovascular risk management slow the development and progression of DR [7–9].

In India, community-based studies have documented a notable prevalence of DR in both urban and rural populations, emphasizing the need for systematic screening and early detection [10,11]. Cataract also contributes materially to visual morbidity in patients with diabetes, and epidemiologic studies have shown a higher incidence and earlier onset of lens opacities among individuals with diabetes compared with non-diabetic counterparts [12–14]. When hypertension coexists, the overall ocular morbidity is amplified, and multiple findings can be present in the same patient.

Despite the clinical importance of these manifestations, local data from secondary-care hospitals are limited. Context-specific descriptions are useful for planning opportunistic screening at medical outpatient visits, strengthening referral pathways, and counseling patients on the ocular consequences of poor systemic control. The objectives of this study were to describe the pattern of ocular manifestations among adults with systemic hypertension and/or DM attending Area Hospital, Thirumalayapalem, and to summarize retinopathy severity and the distribution of fundus abnormalities across disease-duration categories.

Materials and Methods

Study design and setting

A hospital-based descriptive observational cross-sectional study was conducted at Area Hospital, Thirumalayapalem, Khammam, Telangana, India, over a two-month period from September 2025 to October 2025. The study sought to characterize the spectrum of ocular manifestations among adults with established systemic hypertension and/or diabetes mellitus attending outpatient services and undergoing comprehensive ocular assessment.

Area Hospital, Thirumalayapalem, is a secondary-level government healthcare institution catering primarily to rural and semi-urban communities. The facility delivers both outpatient and inpatient care, including general medicine services with dedicated follow-up for chronic non-communicable diseases such as hypertension and diabetes mellitus. Essential laboratory diagnostics and pharmacy services are available within the hospital premises. Ophthalmic services encompass measurement of visual acuity, slit-lamp examination, anterior segment evaluation, intraocular pressure assessment, and dilated fundus examination. Cases necessitating advanced retinal imaging, laser therapy, or surgical management are referred to tertiary care centers for specialized intervention.

Participants and eligibility

Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol.6 No. 12 (2025): December 2025 Issue
https://doi.org/10.51168/sjhrafrica.v6i12.2341
Original Article

Adults aged ≥18 years with a documented diagnosis of systemic hypertension and/or diabetes mellitus were eligible. Participants were recruited consecutively until the sample size was reached. Individuals with a history of ocular trauma, prior retinal laser or vitreoretinal surgery, known glaucoma on treatment, active ocular infection, or media opacity precluding fundus evaluation were excluded. Written informed consent was obtained before enrolment.

Sample Size Determination

The sample size was calculated using the standard formula for estimating a single population proportion in cross-sectional studies:

$$n = \frac{Z^2 \times p \times (1-p)}{d^2}$$

Where:

- n = required sample size
- Z = standard normal deviate at 95% confidence level (1.96)
- p = anticipated prevalence of ocular manifestations (taken as 50% in the absence of precise local data to ensure maximum sample size)
- d = absolute precision (14%)

Substituting the values:

$$n = \frac{(1.96)^2 \times 0.5 \times 0.5}{(0.14)^2} = \frac{3.8416 \times 0.25}{0.0196}$$

$$is\ n \approx 49$$

The calculated minimum sample size was 49, which was rounded to 50 participants to ensure adequacy and feasibility within the study duration.

Sampling Technique

A consecutive sampling method was adopted for participant recruitment. All adults aged ≥18 years with a documented diagnosis of systemic hypertension and/or diabetes mellitus who attended the outpatient department during the study period were screened for eligibility. Individuals fulfilling the inclusion criteria and providing written informed consent were enrolled sequentially until the target sample size of 50 participants was attained. This method minimized selection bias within the defined study timeframe and ensured systematic inclusion of eligible cases.

Data Collection and Ocular Assessment

Data were collected using a predesigned structured proforma that recorded demographic variables (age and sex), systemic diagnosis (hypertension, diabetes mellitus, or both), and duration of systemic illness (≤5 years, 6–10 years, and >10 years).

Comprehensive ocular evaluation included measurement of best-corrected visual acuity using a standard vision chart, anterior segment examination with torchlight and slit-lamp biomicroscopy, and lens assessment for the presence of cataract. Intraocular pressure was measured where indicated. Pupillary dilation was performed using standard mydriatic agents unless contraindicated.

Dilated fundus examination was carried out using direct ophthalmoscopy and slit-lamp biomicroscopy with a 90-diopter lens. Indirect ophthalmoscopy was performed when peripheral retinal evaluation was required. All findings were documented per participant, and coexisting ocular abnormalities were recorded independently.

Definitions and grading

Hypertensive retinopathy was identified by retinal arteriolar narrowing, arteriovenous (AV) crossing changes, retinal hemorrhages and/or exudates, and optic disc changes compatible with hypertensive ocular involvement [1,2]. Diabetic retinopathy (DR) and diabetic macular edema (DME) were graded clinically using accepted international severity definitions; DME was recorded when macular thickening and/or hard exudates involving the macular region were noted on examination [6]. For summarizing severity among eyes with retinopathy, grades were grouped into mild non-proliferative, moderate non-proliferative, severe non-proliferative, and proliferative retinopathy, consistent with commonly used clinical groupings [6].

Bias and Measures to Minimize Bias

Bias was minimized through several measures. Consecutive sampling ensured all eligible patients attending the outpatient department during the study period were enrolled, reducing selection bias. Uniform inclusion and exclusion criteria were applied consistently. Information bias was addressed by using standardized ocular examination protocols, with trained

Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol.6 No. 12 (2025): December 2025 Issue
https://doi.org/10.51168/sjhrafrica.v6i12.2341
Original Article

personnel conducting all assessments and documenting findings using a structured proforma. Measurement bias was reduced by employing internationally accepted grading criteria for retinopathy and performing routine pupillary dilation to enhance fundus visualization. While the study did not involve analytical comparisons, key variables such as disease duration were recorded to contextualize results and interpret potential confounding.

Ethical considerations

The protocol followed the principles of the Declaration of Helsinki. Administrative permission and ethics approval processes were completed before recruitment, and confidentiality was maintained by using de-identified study codes and restricted access to data.

Statistical analysis

Data were entered into a spreadsheet and analysed using descriptive statistics. Categorical variables were summarized as frequencies and percentages, and continuous variables were summarized as means with standard deviation. Ocular manifestations were described overall and explored across disease-duration categories using proportion comparisons. Because the study was descriptive and not powered for formal hypothesis testing, inferential statistics were not emphasized.

Results

Participant Flow

During the two-month study period, 68 adults with a documented history of systemic hypertension and/or diabetes mellitus attended the outpatient services and were screened for eligibility. Of these, 62 individuals met the preliminary inclusion criteria and were assessed further.

Twelve individuals were excluded: 5 had significant media opacity precluding adequate fundus evaluation, 3 had a history of prior retinal laser or vitreoretinal surgery, 2 had active ocular infection at presentation, and 2 declined to provide written informed consent.

A total of 50 eligible participants were enrolled and underwent a complete ocular evaluation. All enrolled participants were included in the final analysis. There were no dropouts after recruitment.

Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol.6 No. 12 (2025): December 2025 Issue
https://doi.org/10.51168/sjhrafrica.v6i12.2341
Original Article

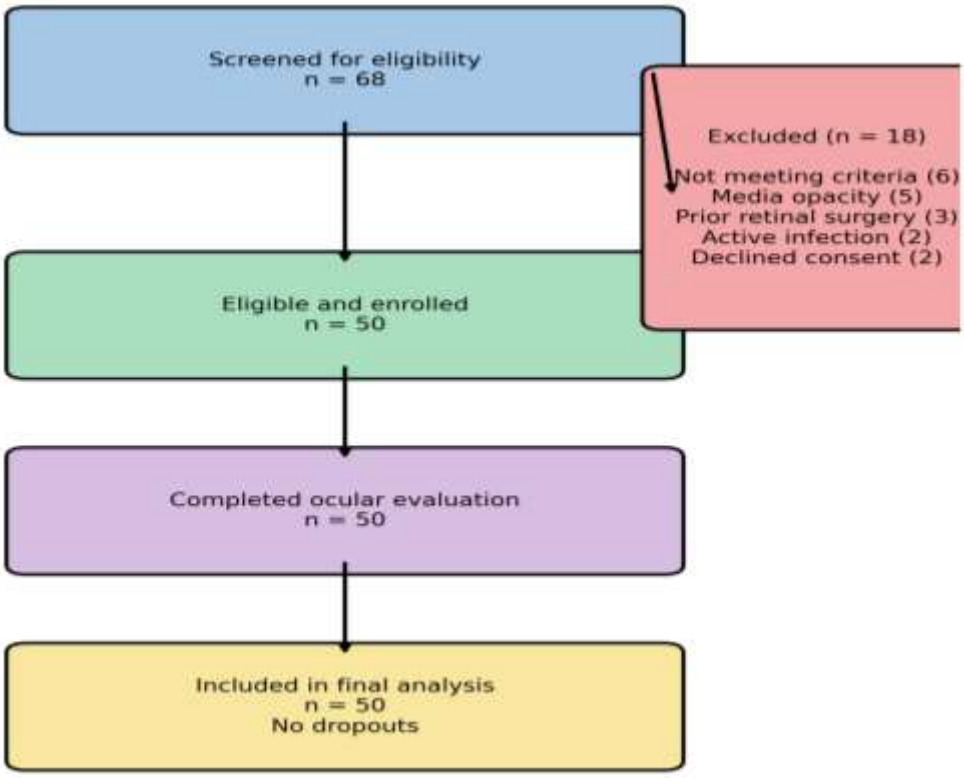

Figure 1: Participant Flow Diagram

A total of 50 participants with systemic hypertension and/or diabetes mellitus were evaluated. The mean age was 56.8 ± 9.4 years (range: 38–75). Most participants were in the 50–59-year age group (36.0%), followed by 60–69 years (28.0%). Men constituted 56.0% of the cohort. Duration of systemic disease was ≤5 years in 42.0%, 6–10 years in 34.0%, and >10 years in 24.0% [Table 1].

Table 1. Demographic and clinical profile of study participants (n = 50)

Variable	n (%) / Mean ± SD
Age (years)	56.8 ± 9.4 (range: 38–75)
Age group	40–49: 10 (20.0) 50–59: 18 (36.0) 60–69: 14 (28.0) ≥70: 8 (16.0)
Sex	Male: 28 (56.0) Female: 22 (44.0)
Duration of systemic disease	≤5 years: 21 (42.0) 6–10 years: 17 (34.0) >10 years: 12 (24.0)

Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol.6 No. 12 (2025): December 2025 Issue
https://doi.org/10.51168/sjhrafrica.v6i12.2341
Original Article

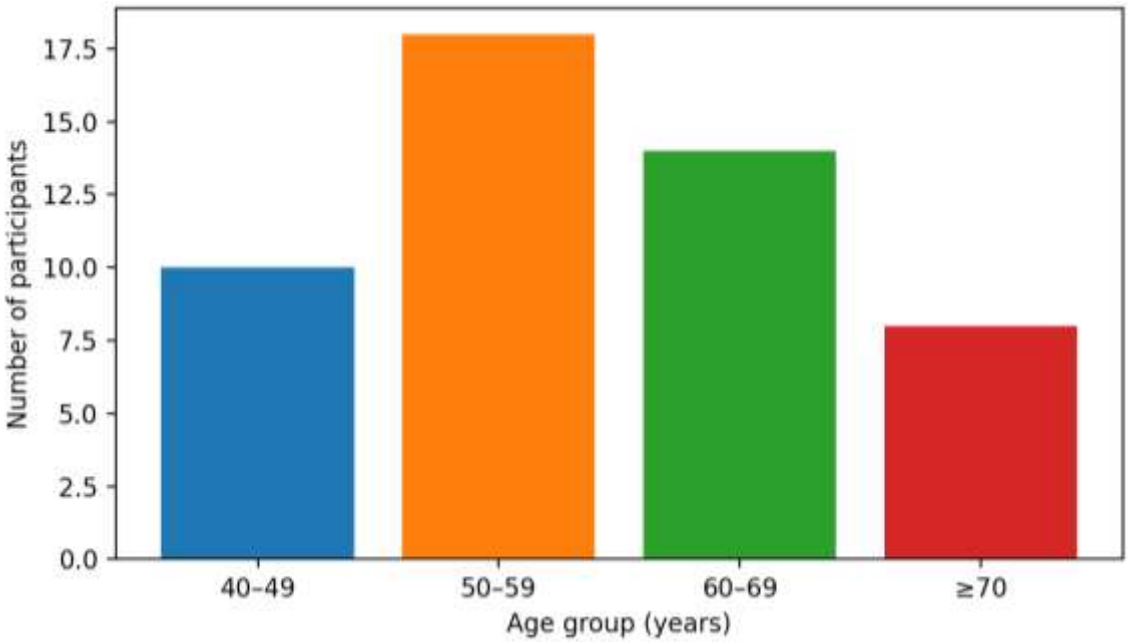

Figure 2: Age Group Distribution

Hypertension alone was present in 18 participants (36.0%), diabetes alone in 14 (28.0%), and combined hypertension with diabetes in 18 (36.0%) [Table 2].

Table 2. Distribution of systemic conditions (n = 50)

Systemic condition	n (%)
Hypertension alone	18 (36.0)
Diabetes mellitus alone	14 (28.0)
Hypertension+Diabetes mellitus	18 (36.0)

Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol.6 No. 12 (2025): December 2025 Issue
https://doi.org/10.51168/sjhrafrica.v6i12.2341
Original Article

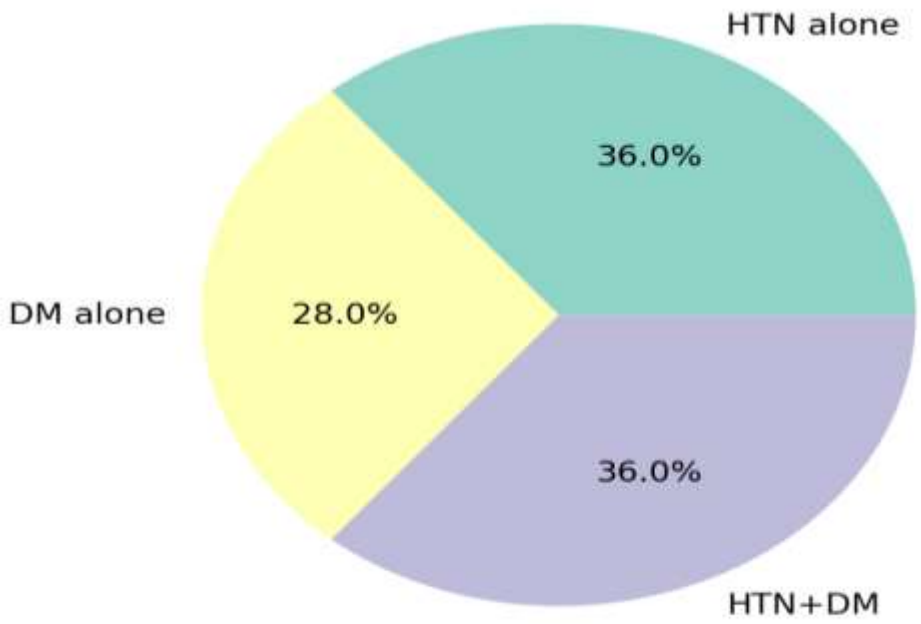

Figure 3: Distribution of Systemic Conditions

Hypertensive retinopathy was the most frequent ocular manifestation (44.0%), followed by diabetic retinopathy of any grade (40.0%) and cataract (36.0%). Arteriovenous crossing changes were noted in 28.0%, and retinal hemorrhages/exudates in 20.0%. Diabetic macular edema was detected in 12.0%. A normal fundus was observed in 18.0% [Table 3]. Multiple ocular findings were documented in several individuals.

Table 3. Pattern of ocular manifestations observed (n = 50)

Ocular finding	**n (%)**
Hypertensive retinopathy	22 (44.0)
Diabetic retinopathy	20 (40.0)
Cataract	18 (36.0)
Diabetic macular edema	6 (12.0)
Retinal hemorrhages/exudates	10 (20.0)
AV crossing changes	14 (28.0)
Optic disc changes	4 (8.0)
Normal fundus	9 (18.0)

Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol.6 No. 12 (2025): December 2025 Issue
https://doi.org/10.51168/sjhrafrica.v6i12.2341
Original Article

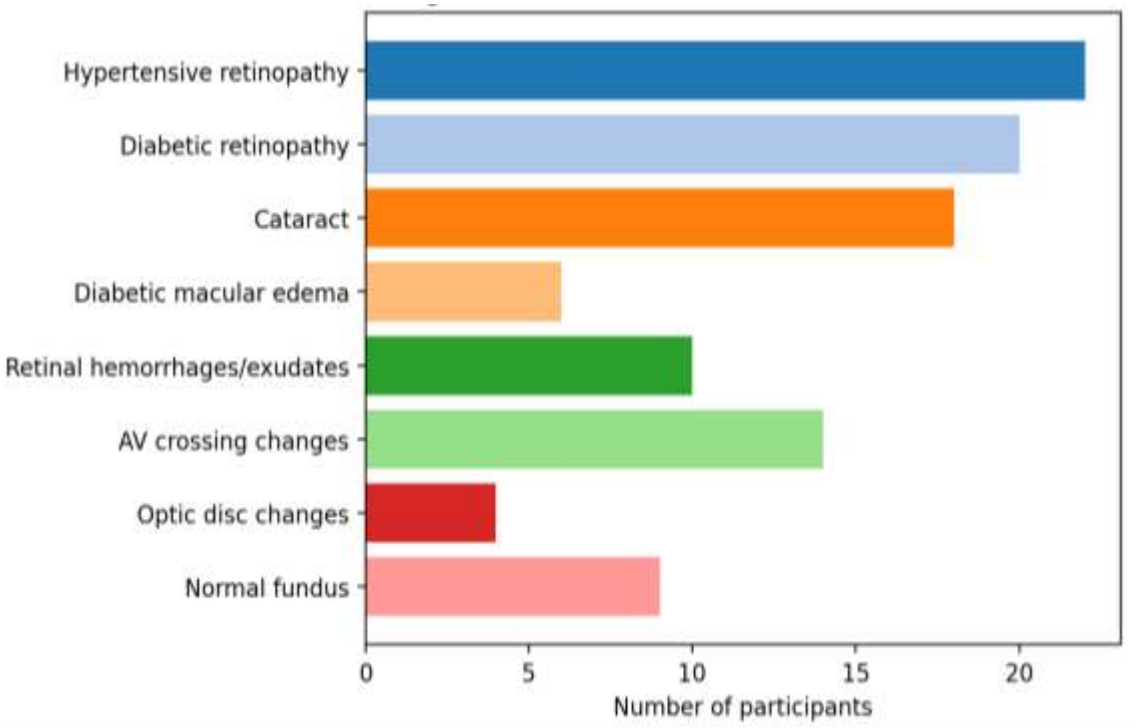

Figure 4: Pattern of Ocular Manifestations

Among 42 eyes with retinopathy, mild non-proliferative changes predominated (42.9%), followed by moderate non-proliferative changes (33.3%). Severe non-proliferative changes and proliferative retinopathy constituted 14.3% and 9.5%, respectively [Table 4].

Table 4. Severity grading of retinopathy (n = 42 eyes with retinopathy)

Severity grade	n (%)
Mild non-proliferative changes	18 (42.9)
Moderate non-proliferative changes	14 (33.3)
Severe non-proliferative changes	6 (14.3)
Proliferative retinopathy	4 (9.5)

Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol.6 No. 12 (2025): December 2025 Issue
https://doi.org/10.51168/sjhrafrica.v6i12.2341
Original Article

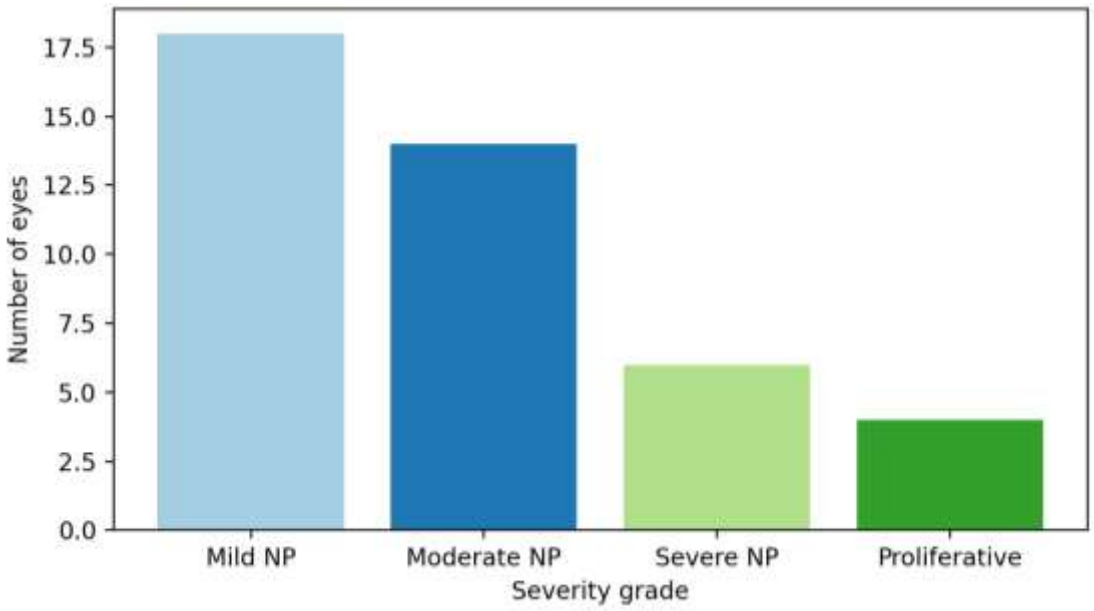

Figure 5: Severity Grading of Retinopathy

Fundus abnormalities were more frequent with longer duration of systemic disease. In participants with duration >10 years (n = 12), 10 (83.3%) demonstrated at least one fundus abnormality, compared with 11 of 21 (52.4%) among those with duration ≤5 years.

Discussion

This descriptive study demonstrates a substantial burden of ocular involvement among adults with systemic hypertension and/or diabetes attending a secondary-care hospital. Hypertensive retinopathy and diabetic retinopathy were the dominant posterior-segment findings, while cataract was the leading anterior-segment abnormality. The high frequency of retinopathy supports the concept that the ocular fundus reflects systemic microvascular injury and that retinal signs can accompany broader cardiovascular and cerebrovascular risk [1–4].

Hypertensive retinopathy was observed in nearly half of the participants, with a sizable proportion exhibiting AV crossing changes and retinal hemorrhages/exudates. Prior work emphasizes that retinal microvascular signs are not only markers of blood pressure exposure but also signals of end-organ vulnerability and stroke risk [2–4]. In resource-constrained settings, structured fundus evaluation during medical clinic visits can therefore serve a dual purpose: identifying ocular disease and prompting reconsideration of systemic risk stratification and control targets.

Diabetic retinopathy was present in 40% of participants, and diabetic macular edema in 12%. Global estimates show that DR remains common and is strongly influenced by duration and metabolic factors [5]. The predominance of mild-to-moderate non-proliferative changes among eyes with retinopathy is consistent with the clinical spectrum expected in outpatient cohorts and highlights a window for early intervention. Severity grading using standardized scales supports clear referral thresholds and follow-up planning [6]. Evidence from landmark trials demonstrates that improved glycemic control reduces microvascular complications, and the benefits of blood pressure control in diabetes extend to microvascular outcomes [7,8]. The ACCORD Eye study further suggests that intensive systemic management, including glycemic and lipid strategies, can reduce

Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol.6 No. 12 (2025): December 2025 Issue
https://doi.org/10.51168/sjhrafrica.v6i12.2341
Original Article

retinopathy progression in selected patients with type 2 diabetes [9].

The association between longer systemic disease duration and a higher proportion of fundus abnormalities in the present study aligns with epidemiologic data. Indian studies from the SN-DREAMS group have reported a meaningful prevalence of DR and identified duration as a key risk factor in both urban and rural cohorts [10,11]. These findings underscore the need for sustained longitudinal follow-up rather than one-time screening. Cataract was documented in over one-third of participants, a result that is biologically plausible given hyperglycemia-related lens changes and has been supported by population-based studies demonstrating increased risk and earlier onset of cataract among individuals with diabetes [12–14].

Generalizability:

These findings are most applicable to adults with hypertension and/or diabetes attending secondary-level public hospitals in similar Indian districts, where screening is often opportunistic, and fundus photography is not routine. The predominance of retinopathy and cataract is likely to be replicated in settings with comparable case-mix and disease-duration profiles. Caution is required when extending these proportions to community surveys, tertiary referral centers, or populations with different access to diabetes and hypertension control.

Conclusion

In this two-month hospital-based assessment of adults with systemic hypertension and/or diabetes, ocular manifestations were frequent and clinically meaningful. Hypertensive retinopathy and diabetic retinopathy accounted for the majority of posterior-segment abnormalities, while cataract represented a major anterior-segment burden. Most eyes with retinopathy showed mild-to-moderate non-proliferative changes, suggesting an opportunity for early detection and counseling before vision-threatening progression. The higher proportion of fundus abnormalities among patients with longer disease duration reinforces the need for regular follow-up and continuity of care. Integrated control of blood pressure and glycemia remains central to risk reduction. Embedding routine eye screening within medical outpatient services can improve timely identification, referral, and prevention of avoidable visual impairment.

Limitations

This study used a small, single-center sample over a short duration, which restricts the precision of prevalence estimates. Participants were recruited from a hospital-attending population, introducing selection bias toward symptomatic or referred individuals. Systemic control parameters (e.g., HbA1c, blood pressure readings, lipid profile) were not incorporated, limiting risk-factor correlation. Fundus photography and optical coherence tomography were not routinely used, which affects the documentation of subtle lesions and macular edema.

Recommendations

Routine eye screening should be integrated into hypertension and diabetes outpatient clinics, with standardized documentation of fundus findings. Patients should receive counseling on blood pressure and glycemic targets, medication adherence, and warning symptoms that warrant urgent review. An annual dilated fundus examination schedule should be reinforced at every visit, with shorter intervals for long disease duration or existing retinopathy. Referral pathways should prioritize suspected diabetic macular edema, proliferative retinopathy, and optic disc changes for early specialist management. Periodic training of medical officers in basic fundus assessment and the use of portable fundus cameras can strengthen detection. A simple registry can support recall, follow-up, and audit.

Acknowledgements

The authors acknowledge the support of the Medical Superintendent and staff of Area Hospital, Thirumalayapalem, Khammam, for facilitating patient flow and examination space. We thank the ophthalmic assistants and nursing staff for their help with pupillary dilation, basic vision testing, and documentation. We also acknowledge support from the medical records team during verification of systemic diagnoses and duration history. The participants are gratefully

Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol.6 No. 12 (2025): December 2025 Issue
https://doi.org/10.51168/sjhrafrica.v6i12.2341
Original Article

acknowledged for their time and cooperation. No external funding was received for this study.

Abbreviations

AV: Arteriovenous
DM: Diabetes mellitus
DME: Diabetic macular edema
DR: Diabetic retinopathy
NPDR: Non-proliferative diabetic retinopathy

Source of funding

The study had no funding.

Conflict of interest

The authors declare no conflict of interest.

Author contributions

KD-Concept and design of the study, results interpretation, review of literature, and preparing the first draft of the manuscript. Statistical analysis and interpretation, revision of manuscript. **PT**-Concept and design of the study, results interpretation, review of literature, and preparing the first draft of the manuscript. Statistical analysis and interpretation, revision of manuscript. **GN**-Concept and design of the study, results interpretation, review of literature, and preparing the first draft of the manuscript. Statistical analysis and interpretation, revision of manuscript.

Data availability:

Data available on request

Author Biography

Dr.Varikuppala Mounika completed her MBBS from Malla Reddy Institute of Medical Sciences (2013–2018), where she developed a strong foundation in clinical medicine and patient care. She pursued her postgraduate training in Ophthalmology at Kakatiya Medical College, Warangal (2020–2023), gaining extensive experience in cataract, glaucoma, and anterior segment evaluation. Following her residency, she served as a Senior Resident in the Department of Ophthalmology at Government Medical College, Khammam, from September 2023 to August 2024. She is currently working as a CAS Specialist at Area Hospital, Thirumalayapalem, Khammam, Telangana, contributing to comprehensive eye-care services and community-based ophthalmic management. **ORCID iD**: https://orcid.org/0009-0008-7970-8082

References

1. Wong TY, Mitchell P. Hypertensive retinopathy. N Engl J Med. 2004 Nov 25;351(22):2310-2317. PMID: 15564546.
2. Wong TY, Mitchell P. The eye in hypertension. Lancet. 2007 Feb 3;369(9559):425-435. PMID: 17276782.
3. Henderson AD, Bruce BB, Newman NJ, Biousse V. Hypertension-related eye abnormalities and the risk of stroke. Rev Neurol Dis. 2011;8(1-2):1-9. PMID: 21769065.
4. Ong YT, Wong TY, Klein R, Klein BE, Mitchell P, Sharrett AR, et al. Hypertensive retinopathy and risk of stroke. Hypertension. 2013 Oct;62(4):706-11. doi: 10.1161/HYPERTENSIONAHA.113.01414. Epub 2013 Aug 12. PMID: 23940194; PMCID: PMC4085393.
5. Yau JWY, Rogers SL, Kawasaki R, Lamoureux EL, Kowalski JW, Bek T, et al. Global prevalence and major risk factors of diabetic retinopathy. Diabetes Care. 2012 Mar;35(3):556-564. PMID: 22301125.
6. Wilkinson CP, Ferris FL 3rd, Klein RE, Lee PP, Agardh CD, Davis M, et al. Proposed international clinical diabetic retinopathy and diabetic macular edema disease severity scales. Ophthalmology. 2003 Sep;110(9):1677-1682. PMID: 13129861.
7. Diabetes Control and Complications Trial Research Group. The effect of intensive treatment of diabetes on the development and progression of long-term complications in insulin-dependent diabetes mellitus. N Engl J Med. 1993 Sep 30;329(14):977-986. PMID: 8366922.
8. UK Prospective Diabetes Study Group. Tight blood pressure control and risk of macrovascular and microvascular complications in type 2 diabetes: UKPDS 38. BMJ. 1998 Sep 12;317(7160):703-713. PMID: 9732337.
9. ACCORD Study Group and ACCORD Eye Study Group. Effects of medical therapies on

Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol.6 No. 12 (2025): December 2025 Issue
https://doi.org/10.51168/sjhrafrica.v6i12.2341
Original Article

retinopathy progression in type 2 diabetes. N Engl J Med. 2010 Jul 15;363(3):233-244. PMID: 20587587.

10. Raman R, Rani PK, Reddi Rachepalle S, Gnanamoorthy P, Uthra S, Kumaramanickavel G, Sharma T. Prevalence of diabetic retinopathy in India: Sankara Nethralaya Diabetic Retinopathy Epidemiology and Molecular Genetic Study report 2. Ophthalmology. 2009 Feb;116(2):311-318. PMID: 19084275.
11. Raman R, Ganesan S, Pal SS, Gella L, Kulothungan V, Sharma T. Incidence and Progression of Diabetic Retinopathy in Urban India: Sankara Nethralaya-Diabetic Retinopathy Epidemiology and Molecular Genetics Study (SN-DREAMS II), Report 1. Ophthalmic Epidemiol. 2017 Oct;24(5):294-302. doi: 10.1080/09286586.2017.1290257. Epub 2017 Mar 23. PMID: 28332894.
12. Klein BE, Klein R, Wang Q, Moss SE. Older-onset diabetes and lens opacities. The Beaver Dam Eye Study. Ophthalmic Epidemiol. 1995 Mar;2(1):49-55. doi: 10.3109/09286589509071451. PMID: 7585233.
13. Klein BE, Klein R, Lee KE. Incidence of age-related cataract: the Beaver Dam Eye Study. Arch Ophthalmol. 1998 Feb;116(2):219-25. doi: 10.1001/archopht. 116.2.219. PMID: 9488275.
14. Rowe NG, Mitchell PG, Cumming RG, Wans JJ. Diabetes, fasting blood glucose, and age-related cataract: the Blue Mountains Eye Study. Ophthalmic Epidemiol. 2000 Jun;7(2):103-14. PMID: 10934461.

PUBLISHER DETAILS

Student's Journal of Health Research (SJHR)
(ISSN 2709-9997) Online
(ISSN 3006-1059) Print
Category: Non-Governmental & Non-profit Organization
Email: studentsjournal2020@gmail.com
WhatsApp: +256 775 434 261
Location: Scholar's Summit Nakigalala, P. O. Box 701432, Entebbe Uganda, East Africa