Clinical study of hypertensive retinopathy in patients with cerebral stroke

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Abstract

Purpose: To study hypertensive retinopathy in patients with cerebral stroke and to grade hypertensive retinopathy in them.

Materials and methods: A hospital based descriptive, cross sectional; observational study was conducted. Study was initiated after institutional ethical approval.

Data was collected from all the 25 patients selected using a structured proforma meeting the objectives of the study after informed consent. The anterior segment evaluation was done with help of slit lamp biomicroscope or torch light and dilated ocular fundus examination was done using Direct Ophthalmoscope, 90 D slit lamp biomicroscope and Indirect ophthalmoscope. Ocular fundus photograph was taken with help of fundus camera. Hypertensive retinopathy grading was done using Keith Wagner Barker classification. Data was analysed by applying appropriate statistical tests.

Results: The majority of patients were in the 46–60 years age group (44%), followed by the 61–75 years group (32%). Grade 1 hypertensive retinopathy was the most common finding (80%), while advanced retinopathy (Grades 3 and 4) was observed in a small proportion of patients. Ischemic stroke was the predominant subtype (84%), with hemorrhagic stroke accounting for 16% of cases. Most patients (92%) had a duration of hypertension of five years or less with a male predominance with 56% male population.

Conclusion: This study demonstrates a high prevalence of hypertensive retinopathy among patients with cerebral stroke, with early retinal changes being the most common presentation. Ischemic stroke constituted the predominant stroke subtype, and increasing systolic blood pressure showed a significant association with greater severity of hypertensive retinopathy. These findings support the role of fundus examination as a valuable, non-invasive marker of hypertension related target organ damage in patients with cerebrovascular disease.

Introduction:

Hypertension remains one of the most important modifiable risk factors contributing to the global burden of stroke. Persistent elevation of blood pressure leads to structural and functional alterations in both large and small blood vessels, predisposing individuals to cerebrovascular events. Early identification of vascular damage in hypertensive individuals is therefore important for predicting stroke risk and implementing preventive strategies.[1] the retinal circulation offers a unique opportunity for in vivo assessment of systemic microvascular changes. Unlike other vascular beds, retinal vessels can be examined directly and non-invasively, allowing visualization of cumulative microcirculatory damage caused by prolonged hypertension. Chronic elevation of blood pressure results in a spectrum of retinal changes involving the retinal arterioles, capillaries, choroid, and optic nerve head, collectively described as hypertensive retinopathy.[2] the retinal and cerebral circulations share several common anatomical, physiological, and embryological characteristics. Both possess autoregulatory mechanisms and barrier systems that maintain vascular integrity, making retinal microvascular alterations a potential surrogate marker for cerebral vascular pathology. Consequently, retinal

findings may reflect parallel changes occurring within the intracranial vasculature. Hence, evaluation of hypertensive retinopathy may provide valuable insights into the severity and duration of systemic hypertension and its association with cerebral stroke. This study was therefore conducted to study the pattern and severity of hypertensive retinopathy in patients presenting with cerebral stroke.[2]

Aim: To study hypertensive retinopathy in patients with cerebral stroke and to grade hypertensive retinopathy in them.

Materials and methods:

A hospital based; descriptive cross-sectional study was carried out at a tertiary care hospital from january 2024 to march 2025. The study commenced after receiving approval from institutional ethical committee and obtaining informed consent from patients and/or relatives. A total of 25 patients admitted for cerebral stroke having hypertension were screened for hypertensive retinopathy. The study included patients with cerebral stroke having hypertension and excluded pediatric patients and patients having known retinal pathologies. Pupils were dilated after checking pupillary reaction, with tropicamide 1% eye drop and fundus examination was done using direct or indirect ophthalmoscope. The grading of hypertensive retinopathy was done using Keith Wagner Barker classification.

Results:

Table no.1: Age wise distribution of patients

AGE GROUP (YEARS)	NUMBER OF PATIENTS	PERCENTAGE (%)
15–30	0	0
31–45	4	16
46–60	11	44
61–75	8	32
>75	2	8
Total	25	100

The majority of hypertensive stroke patients belonged to the 46–60 years age group 44%, followed by the 61–75 years age group 32%, indicating a higher burden of disease in the middle-aged and elderly population, with minimal representation at younger ages.

Fig no.1: Gender wise distribution of patients

Of the 25 patients included in the study, 56% were males and 44% were females, indicating male predominance.

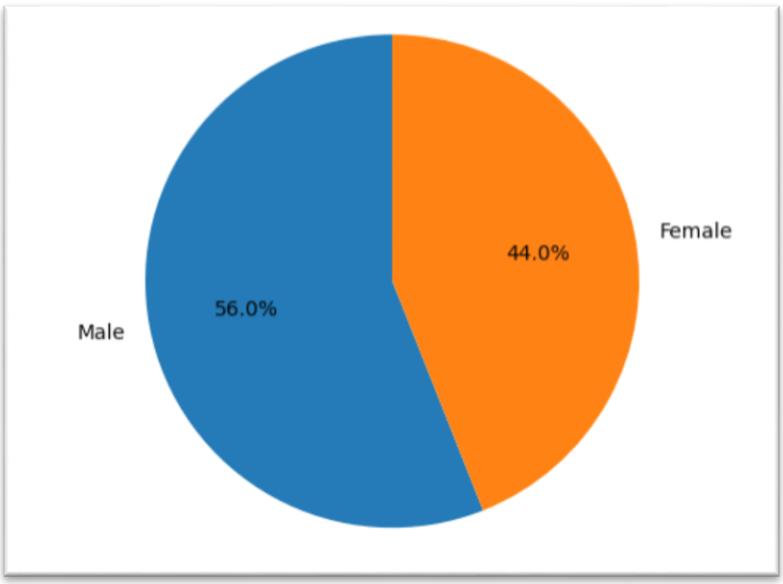


Fig no. 2: Distribution of patients based upon grading of hypertensive retinopathy

The majority of patients exhibited grade 1 hypertensive retinopathy 80%, indicating predominantly early retinal changes, while stages grade 3 and grade 4 were observed in only in 8% of patients, reflecting limited severe retinal involvement in the study population.

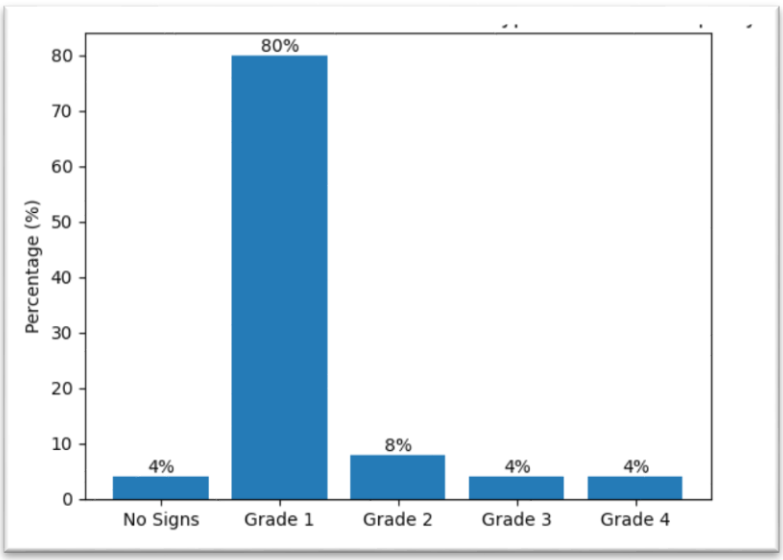


Fig no.3: Distribution of patients based upon duration of hypertension

The majority of patients, 92%, had a duration of hypertension of 0–5 years. Only 8% had hypertension for 6–10 years, while none of the patients had a duration of hypertension greater than 10 years. This indicates that most patients in the study had a relatively shorter duration of diagnosed hypertension.

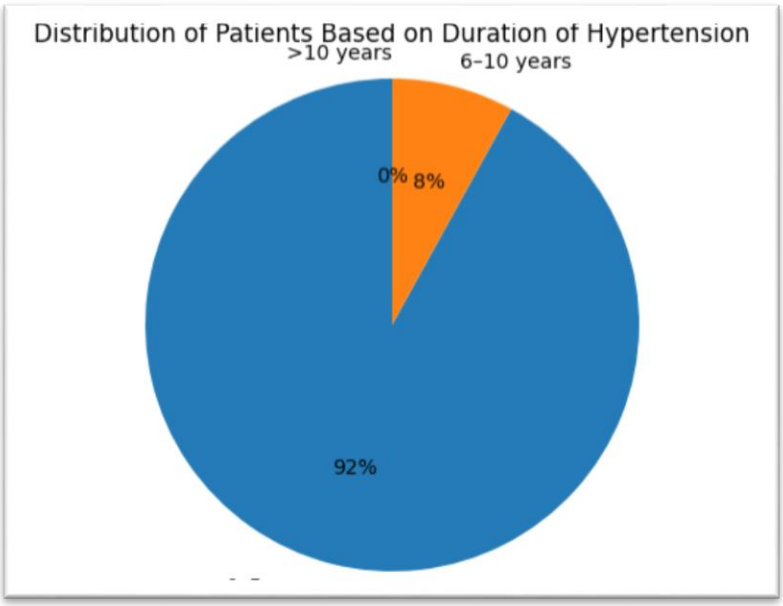
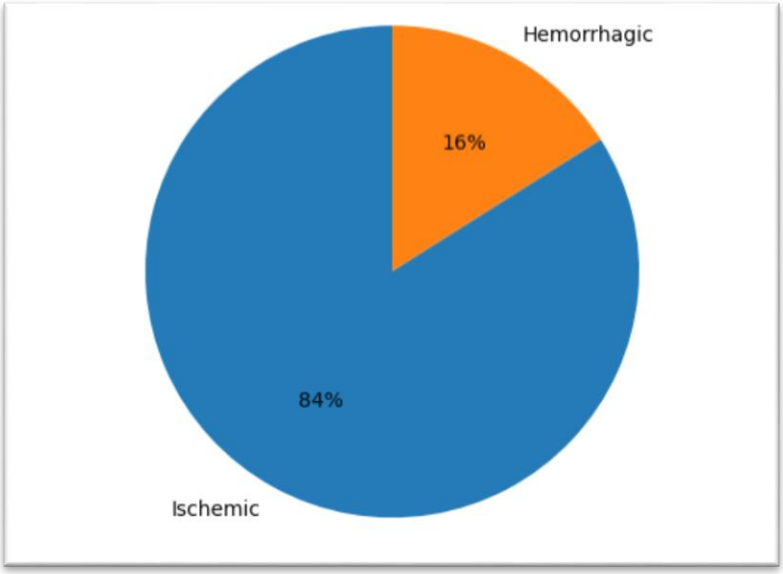


Fig No. 4: Distribution of type of stroke

Ischemic stroke constituted the majority of cases 84% among the study population, while haemorrhagic stroke accounted for only 16% patients.



Discussion: the majority of patients were in the 46–60 years age group 44%, followed by the 61–75 years group 32%. Grade 1 hypertensive retinopathy was the most common finding 80%, while grades 3 and 4 was observed in 8% of patients. Ischemic stroke was the predominant subtype 84%, with haemorrhagic stroke accounting for 16% of cases. Most patients 92% had a duration of hypertension of five years or less.

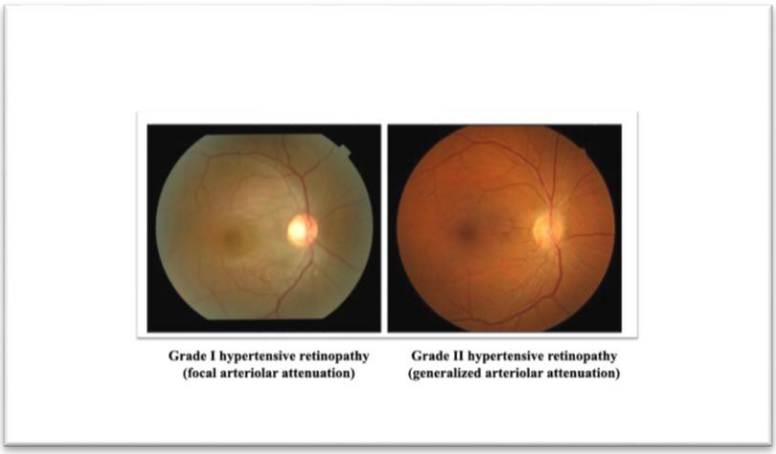
In the present study, the majority of hypertensive stroke patients belonged to the 46–60 years age group 44%, followed by the 61–75 years group 32%. This distribution suggests that stroke related to hypertension predominantly affects middle aged and elderly individuals, likely due to the cumulative effects of long standing vascular risk factors. Similar observations have been reported in indian epidemiological studies, including the review by banerjee and das, which highlighted a higher burden of stroke among individuals in the fifth and sixth decades of life.[3] the evaluation of fundus findings revealed that grade 1 hypertensive retinopathy was the most frequent retinal manifestation 80%. This indicates that early microvascular changes are more commonly encountered in hypertensive stroke patients. Grade 3 and grade 4 hypertensive retinopathy were relatively uncommon in the present study population 8%, suggesting that retinal damage may not always parallel the occurrence of cerebrovascular events. These findings are in agreement with the observations of wong and mitchell, who reported that mild hypertensive retinopathy changes such as generalized arteriolar narrowing and arteriovenous crossing changes are far more prevalent than advanced retinal manifestations in hypertensive individuals.[4] in the present study, ischemic stroke constituted the predominant presentation in this study 84%, while haemorrhagic stroke accounted for a smaller proportion of cases 16%, demonstrating a clear predominance of ischemic events among hypertensive patients. This pattern aligns with global and regional data identifying ischemic stroke as the most common form of cerebrovascular disease, including the interstroke study, which demonstrated that ischemic stroke represents the most common subtype of stroke worldwide, particularly in patients with hypertension as a major modifiable risk factor.[5] in the present study, a majority of patients 92% had a documented duration of hypertension of ≤5 years, while only 8% had hypertension for 6–10 years, and none had a duration exceeding 10 years. The interstroke study by o'donnell et al. Demonstrated that hypertension is the most significant modifiable risk factor for stroke across diverse populations, with stroke risk being strongly influenced by the presence and control of hypertension rather than the duration alone.[5] these findings support our observation that even a relatively short documented duration of hypertension can be associated with stroke, especially in cases of poor blood pressure control.[5] in the present study, males constituted 56% proportion of the study population compared to females 44%, indicating a male predominance among hypertensive stroke patients. This observation is consistent with findings from large epidemiological and clinical studies, including the interstroke study, which reported a higher incidence of stroke among males across most geographic regions, likely reflecting differences in exposure to vascular risk factors and health seeking behavior.[5]

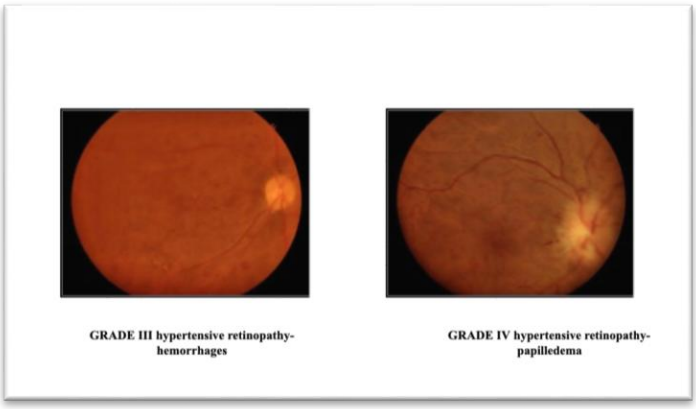
Conclusion:

The present study demonstrates that hypertensive stroke predominantly affects the middle-aged and elderly population, with most patients belonging to the 46–60 and 61–75 year age groups. A male predominance was observed. Ischemic stroke constituted the most common subtype, reinforcing the strong association between hypertension and cerebral infarction.

The majority of patients had a relatively short documented duration of hypertension, suggesting that cerebrovascular events may occur early in the disease course, particularly in the presence of undiagnosed or poorly controlled blood pressure. Most patients exhibited early retinal vascular changes in the form of Grade 1 hypertensive retinopathy, indicating that retinal microvascular damage can be detected even in the early stages of systemic hypertension.

These findings highlight the value of fundus examination as a simple, non-invasive tool for assessing systemic microvascular involvement and emphasize the importance of early detection, regular monitoring, and optimal management of hypertension to prevent both retinal and cerebrovascular complications.





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