

Epidemiological Profile and Proportion of Retinopathy in Hypertensive Patients in A Tertiary Care Centre of South India

Tamilarasi^{1*}, Keerthana V², Isha S³, Seenivasan P⁴

^{1,2,3,4}Department of Community Medicine, Government Stanley Medical College, Chennai, India

ABSTRACT

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*Corresponding author:

Dr. R. Tamilarasi

(Email: kdeepa.111980@gmail.com)

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Background: Hypertensive retinopathy in a population indicates the level of hypertension control and risk for cardiovascular events and a 10-year risk of stroke mortality. So early detection of retinopathy is crucial for various reasons.

Methodology: This study was conducted on 300 patients without known retinal problems included by convenient sampling method in the hypertension clinic at a tertiary care facility in Chennai from August to December 2021. Data was gathered using a questionnaire by in-person interviews and dilated fundoscopic examination. The Chi square test and the Fischer's exact test were used for associations.

Results: The average age of the participants was 59.13 (± 9.7) years. 188(62.7%) participants had hypertension for less than five years and 13.3% had regular eye check. The prevalence of retinopathy is 49.3%. In which 28%, 17.3%, 4% had Grade 1, Grade 2, Grade 3 respectively. Patients with hypertension more than 5 years, non-compliance to medications, not doing regular blood pressure check, being employed in non-professional occupation, with history of ocular pain and impaired vision had significant association with retinopathy.

Conclusions: As the study had half the hypertensive patients with retinopathy, it is imperative to provide comprehensive health education and prioritize regular screening for retinopathic changes among hypertensive patients.

Keywords: Hypertensive Retinopathy, Hypertension Control, Cardiovascular Risk, Early Detection, Prevalence and Risk Factors

INTRODUCTION

The worldwide prevalence of noncommunicable diseases (NCD), particularly hypertension and diabetes, are on the rise. In the year 2000, it was estimated that 26% of the world's population (972 million people) had hypertension, and this numbers are expected to increase up to 29% by 2025, primarily in economically developing nations.[1]

Poorly controlled hypertension can have a significant impact on various organs such as the brain, heart, kidneys, and eyes, leading to damage in these target organs. Hypertension is a well-established risk factor for several eye conditions that can even threaten vision, including retinal vascular occlusion, retinal microaneurysm, and non-arteritic anterior ischemic optic neuropathy. Among these hypertensive changes, hypertensive retinopathy (HR) is found to be the most common.[2]

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Hypertensive retinopathy occurs due to damage to the retinal blood vessels, and it can cause three types of ocular damage: retinopathy, optic neuropathy, and chorioidopathy. Therefore, retinal microvascular changes serve as indicative signs of hypertensive retinopathy and can assist in determining its severity and guiding treatment for hypertension. The rise in systemic blood pressure affects the retinal vessels, leading to constriction. Early and timely detection of hypertension can be beneficial in preventing hypertensive retinopathy.[3]

In a nested case-control study in patients with age related eye diseases in Wisconsin (the Beaver Dam Eye Study) the presence of retinal microaneurysms, retinal haemorrhages, and retinal arteriolar narrowing was associated with a high 10-year risk of stroke mortality.[4]

Added to hypertension, genetics also plays a role as an etiological factor for hypertensive retinopathy. It has been largely reported that hypertensive retinopathy is linked to cardiovascular morbidity and mortality. Hence, the frequency and the range of hypertensive retinopathy in the population indicate the level of hypertension control and the associated risks for cardiovascular events. In addition, hypertensive retinopathy can serve as a tool for cardiovascular risk assessment for the clinical management of hypertensive patients.[5]

Hence, the early detection of hypertensive retinopathy in hypertensive patients is crucial for various reasons, including preventing the progression of visual and cardiac complications. Given the significance of hypertensive retinopathy, this research aimed to assess the frequency, stages, and the factors related to hypertensive retinopathy among known hypertensive individuals receiving care at the hypertension outpatient department in a tertiary care hospital in South India.

MATERIALS AND METHODS

This is a cross-sectional study which was conducted between August 2021 and December 2021 on 300 hypertensive patients who visited the hypertension outpatient department at a tertiary healthcare facility in Chennai. The method of convenient sampling was applied to include the participants for the study. The study included all patients who gave their consent to participate, regardless of their age and gender. Patients with hypertension who had pre-existing retinal problems, diabetes, cardiovascular disease, chronic renal disease, or other comorbidities were not included in the study. Ethical clearance was obtained from the Institutional Ethics Committee, and the study was conducted in accordance to the tenets of Declaration of Helsinki. Data was gathered using a predesigned questionnaire through in-person interviews after obtained the written informed consent from all the included hypertensive patients visiting the hypertension clinic. The questionnaire included sociodemographic information, information about ocular symptoms, specific lifestyle factors, as well as previous instances underlying hypertension. Blood pressure measurement, slit lamp

examination and dilated fundoscopic examination was carried out for all the participants and the findings were recorded. Blood pressure measurement was taken by the investigators and the fundoscopic examination was done at ophthalmology department by an experienced Optometrist. Data was recorded into an MS Excel sheet and statistical analysis was done using the IBM SPSS Software. The frequency and percentage of the data were used for descriptive statistical analysis. The Chi square test and the Fischer's exact test were used to identify statistically significant association among various factors related to hypertensive retinopathy. A value of 'P' less than 0.05 was considered significant. Keith Wagener Barker (KWB) grading system was used to classify different grades of hypertensive retinopathy. According to Keith and Wagner's classification, hypertensive retinopathy is graded as follows:[6]

Grade 1: Mild arteriolar attenuation, broadening of arteriolar light reflex.

Grade 2: Severe arteriolar constriction associated with deflection of veins at arteriovenous crossings.

Grade 3: Copper wiring of arterioles, banking and tapering of veins, right angled deflection of veins, haemorrhages, cotton wool spots, hard exudates.

Grade 4: Changes of grade 3, silver wiring of arterioles, disc swelling.

Approval of Institutional Ethical Review Board: Obtained (SMC/2021248).

RESULTS

Demographic characteristics: This study included 300 hypertensive patients, with most of them being females (174, 58%). The mean age of the study participants was 59.13 (+/- 9.7) years, and significant numbers (128, 42.7%) were elderly, aged over 60 years. A considerable number (98, 32.7%) were unemployed, while the majority (186, 62%) were engaged in various occupations such as skilled, semiskilled, or unskilled work.

Table 1: Characteristics of study participants (N =300)

Characteristics	Participants (%)
Age category (Years)	
41-50	76 (25.3)
51-60	96 (32)
61-70	88 (29.4)
>70	40 (13.3)
Sex	
Male	126 (42)
Female	174 (58)
Education	
Illiterate	36 (12)
Schooling only	250 (83.3)
Degree	14 (4.7)
Occupation	
Unemployed	98 (32.7)
Other occupations	186 (62)
Professional & Semi- professional	16 (5.3)

Table 2: Associated factors of Hypertension (N=300)

Variables	Cases (%)
Health care Seeking Parameters	
First time diagnosis	
During routine checks up	136 (45.3)
During emergency service	158 (52.7)
During screening program	6 (2.0)
Duration of Hypertension	
Up to 5 years	188 (62.7)
6 to 10 years	78 (26.0)
>10 years	34 (11.3)
Place of diagnosis of HT	
Govt	224 (74.7)
Private	62 (20.7)
Others	14 (4.6)
Regular eye checks up	40 (13.3)
Regular Blood pressure check up	212 (70.7)
Take medications regularly	162 (54.0)
Risk factors & Symptoms	
Taking Alcohol	44(14.7)
Smoker	52(17.3)
Doing Physical activity	76(25.3)
Family history of HT	156(52.0)
Headache	146(48.7)
Dizziness	128(42.7)
Ocular pain	94(31.3)
Impaired vision	174(58.0)

Table 3: Proportion of Hypertensive Retinopathy

Hypertensive Retinopathy	Cases (%)
Retinopathic Changes (N=300)	
No	152 (50.7)
Yes	148 (49.3)
Grades Of Hypertensive Retinopathy (N=148)	
Grade 1	84 (28)
Grade 2	52 (17.3)
Grade 3	12 (4)

Only a small percentage (16, 5.3%) were involved in professional or semi-professional work. Additionally, most of them had gone to school (250,83.3%), some (36, 12%) of the participants were illiterate, and only a few (14, 4.7%) had completed a degree course. The socio-demographic characteristics of the study population are exhibited in table 1.

Hypertension status: About half (52.7%) of the patients received their diagnosis of hypertension while seeking emergency care; for the remaining patients, the diagnosis was made coincidentally during a screening program or regular check-up and most of the participants had their diagnosis at a government run hospital (224,74.7%). The total duration of hypertension among this study participants ranges from one year to 20 years. Mean duration is 5.49 (+/- 4.72) years. Many study participants (188,62.7%) had hypertension for less than five years, and 162 (54%) participants regularly took their medications. Additionally, 212 (70.7%) participants checked their blood pressure at least once in every three months, but only 40,13.3% had checked their eyes for changes related to hypertension.

Hypertensive Retinopathy symptoms: In the last three months, the participants were asked if they had experienced any symptoms related to hypertensive retinopathy and almost all the patients had any one of the symptoms asked. Thirty one percent of the patients stated that they experienced eye pain, and almost half of the hypertensive patients had a history of headache, forty three percent had complaints of dizziness, and fifty eight percent of patients had reported having visual impairment.

Table 2 displays the findings of the additional factors for hypertension and hypertensive retinopathy, which included alcohol, smoking, family history, and physical activity.

Proportion of Hypertensive Retinopathy: Out of the 300 patients who underwent slit lamp examination and dilated fundoscopic examination, 148 individuals (49.3%) exhibited retinopathic changes of varying degrees. Among them, the largest proportion of participants, (84 individuals, 28%) had grade 1 changes. Grade 2 changes were observed in 52 participants (17.3%), while only 12 individuals (4%) had grade 3 alterations. These findings are presented in Table 3.

According to univariate analysis, a greater number of cases of hypertensive retinopathy is seen in females and participants above 60 years of age, however this difference is not statistically significant. Retinopathic changes were observed in 61% of the participants who were illiterate, 49% of those who had gone to school alone, and 43% of those who had at least one degree, although no statistically significant difference was found in these differences. The presence of hypertensive retinopathic changes was not significantly associated with current smokers, consuming alcohol, and those with a family history of hypertension; However, employment in non-professional occupations as well as unemployment were significantly correlated ($p < 0.05$) with hypertensive retinopathy. Table 4 presents the results.

This study examined the relationship between the presence of hypertensive retinopathic changes and the status of hypertension. It found that a higher percentage of participants with hypertension for six to ten years, not taking medications on a regular basis, and the participants who did not have their blood pressure checked on a regular basis were significantly more likely to have hypertensive retinopathy ($p < 0.05$). A statistically significant association was found between the presence of retinopathy-related symptoms specifically impaired vision and ocular pain and hypertensive retinopathy. (Table 5)

Individual blood pressure measurements were done for all the participants before sending them for fundoscopic examination. The systolic pressure ranged from 110 to 250 and the diastolic pressure ranged from 70 to 140. The mean systolic pressure was 145.4 +/- 20.8 and the mean diastolic pressure was 88.2 +/- 9.8. But the level of blood pressure in the participants and the presence of hypertensive retinopathy has no statistically significant association.

Table 4: Demographic characteristics and Hypertensive Retinopathy (N = 300)

Parameters	Hypertensive Retinopathy (N=300)				Total (%)	p value
	No changes (%)	Grade 1 (%)	Grade 2 (%)	Grade 3 (%)		
Adult & Elderly						
< = 60 years	92 (53.5)	52 (30.2)	22 (12.8)	6 (3.5)	172 (100)	0.354
>60 years	60 (46.9)	32 (25.0)	30 (23.4)	6 (4.7)	128 (100)	
Sex						
Male	72 (57.1)	24 (19.0)	22 (17.5)	8 (6.3)	126 (100)	0.128
Female	80 (46.0)	60 (34.5)	30 (17.2)	4 (2.3)	174 (100)	
Occupation level						
Unemployed	62 (63.3)	16 (16.3)	18 (18.4)	2 (2.0)	98 (100)	0.042*
Other occupations	84 (45.2)	64 (34.4)	32 (17.2)	6 (3.2)	186 (100)	
Professional & Semi-professional	6 (37.5)	4 (25.0)	2 (12.5)	4 (25)	16 (100)	
Education						
Illiterate	14 (38.9)	6 (16.7)	12 (33.3)	4 (11.1)	36 (100)	0.155
Schooling only	130 (52.)	76 (30.4)	36 (14.4)	8 (3.2)	250 (100)	
Degree holder	8 (57.1)	2 (14.3)	4 (28.6)	0 (0.0)	14 (100)	
Family history						
Yes	70 (44.9)	50 (32.1)	30 (19.2)	6 (3.8)	156 (100)	0.502
No	82 (56.9)	34 (23.6)	22 (15.3)	6 (4.2)	144 (100)	
Alcohol						
Yes	24 (54.5)	8 (18.20)	10 (22.7)	2 (4.5)	44 (100)	0.628
No	128 (50.)	76 (29.7)	42 (16.4)	10 (3.9)	156 (100)	
Smoking						
Yes	26 (50.0)	12 (23.1)	14 (26.9)	0(0.00)	52 (100)	0.414
No	126 (50.8)	72 (29.0)	38 (15.3)	12 (4.8)	248 (100)	
Total	152 (50.7%)	84 (28.0)	52 (17.3)	12 (4.0)	300 (100)	

Table 5: Relation of Hypertensive status and Hypertensive Retinopathy (N = 300)

Parameters	Hypertensive Retinopathy (N=300)				Total (%)	p value
	No changes (%)	Grade 1 (%)	Grade 2 (%)	Grade 3 (%)		
Duration of Hypertension						
Upto 5 years	118 (62.8)	48 (25.5)	18 (9.60)	4 (2.1)	188 (100)	0.001*
6 to 10 years	18 (23.1)	24 (30.8)	28 (35.8)	8 (10.3)	78 (100)	
>10 years	16 (47.1)	12 (35.3)	6 (17.6)	0(0)	34 (100)	
Taking medications regularly						
Yes	100 (61.7)	44 (27.2)	18 (11.1)	0 (0)	162 (100)	0.002*
No	52 (37.70)	40 (29.0)	34 (24.6)	12(8.7)	138 (100)	
Regular BP check up						
Yes	110 (51.9)	64 (30.2)	38 (17.9)	0 (0)	212 (100)	0.003*
No	42 (47.8)	20 (22.7)	14 (15.9)	12(13.6)	88 (100)	
Regular eye checks up						
Yes	22 (55.0)	6 (15.00)	12 (30.0)	0 (0)	40 (100)	0.235
No	130 (50.0)	78 (30.0)	40 (15.4)	12 (4.6)	260 (100)	
Headache						
Yes	68 (46.6)	46 (31.5)	26 (17.8)	6 (4.1)	146 (100)	0.767
No	84 (54.5)	38 (24.7)	26 (16.9)	6 (3.9)	154 (100)	
Ocular pain						
Yes	34 (36.2)	42 (44.7)	14 (14.9)	4 (4.2)	94 (100)	0.018*
No	118 (57.3)	42 (20.4)	38 (18.4)	8 (3.9)	206 (100)	
Impaired vision						
Yes	70 (40.3)	58 (33.3)	34 (19.5)	12 (6.9)	174 (100)	0.008*
No	82 (65.1)	26 (20.6)	18 (14.3)	0 (0)	126 (100)	
Total	152 (50.7)	84 (28.0)	52 (17.3)	12 (4.0)	300 (100)	

DISCUSSION

There was a substantial variation in the proportion of retinopathy among people with hypertension across the globe. Hypertension is one among the most common chronic medical conditions in middle aged and elderly population and it is also a primary risk factor for various complications including retinopathy. In this study the

proportion of hypertensive retinopathy is 49.3%. The similar finding was reported in a study done by Erden et al which documented the presence of hypertensive retinopathy in 66.3%.[7] But the study by Kabedi et al has stated that the incidence of hypertensive retinopathy is 83.6%. [8] However few studies have showed a lower rate of retinopathy too. Likewise, a study by Klein R et al has recorded a lower rate of hypertensive retinopathy as

7.8%. [9]

The higher proportion of hypertensive retinopathy in our study may be due to duration of hypertension, non-compliance to medications, not having regular tracking and control of the blood pressure level due to lack of awareness. In this study, the presence of grade I, II and grade III hypertensive retinopathy was 28%, 17.3% and 4% respectively.

We found a very higher proportion of mild hypertensive retinopathy. This is like a study done in Malawi where mild grades reported in 70.2% of the study participants and a study done in Bangladesh where the proportion of grade 1 and grade 2 retinopathies among hypertensive patients was 46% and 32%, respectively, and only a few hypertensive patients (<2%) showed grade 3. [10,11] The same finding was also found in a study done in Ghana where the prevalence of mild grades of retinopathy among hypertensive persons was as high as 69.4%. [12]

The mean age of this study participants was 59.13 years. Similar age group was screened for hypertensive retinopathy in studies by Bastola P et al and by Pun, C., & Tuladhar, S. Other studies like by Mondal RN examined hypertension retinopathy at fifties. [12-14] While this study had not found a statistically significant difference in the proportion of hypertensive retinopathy between males and females, other studies had presented contrasting findings. For instance, Pun, C et al & Tuladhar et al observed a higher prevalence among males compared to females, whereas a study conducted by Mondal et al in Bangladesh reported a higher prevalence among females than males. [12-14]

In this study we observed that, non-compliance to medications, not doing regular blood pressure check, being employed in non-professional occupations, and unemployed patients had significant association with hypertensive retinopathy. Also, in this study many hypertensive patients who had history of ocular pain and impaired vision had statistically significant association with hypertensive retinopathy. The symptoms of retinopathy have not been reported in many studies but previous studies have documented a comparable correlation between the duration since diagnosis of hypertension and the occurrence of retinopathy which is not found in the current study. [12,15,16]

This study has gathered valuable data on various factors and symptoms predictive to retinopathy in hypertensive patients, which can support screening and awareness activities and serve as a foundation for larger studies to explore additional risk factors and broader implications for hypertensive retinopathy prevention and management. However, this study was conducted in a hospital setting with a small sample size that could have given the larger proportion of hypertensive retinopathy as there might be bias in the selection of study participants and the findings of this study may not be generalizable to the total population of patients with hypertension. More research is needed with larger, more diverse sample sizes across multiple sites to determine if the find-

ings hold true for the overall population of those with high blood pressure.

CONCLUSION

Nearly half of the individuals with hypertension exhibited retinopathic changes in the present study and most of the patients had developed certain retinopathy related symptoms at the time of diagnosis. Therefore, it is imperative to consistently provide comprehensive health education and raise awareness regarding follow up and the potential complications of hypertension, particularly hypertensive retinopathy. Additionally, it is crucial to prioritize regular screening for retinopathic symptoms and fundus changes among hypertensive patients.

Authors' Contributions: **TR** contributed to the study conception, design, data collection, analysis and interpretation, and manuscript preparation. **KV** was involved in all aspects of the study, including conception, design, data collection, analysis and interpretation, and manuscript preparation. **SI** also participated in study conception, design, data collection, analysis and interpretation, and manuscript preparation. **SP** contributed to the study conception, design, data analysis and interpretation, and manuscript preparation.

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