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Prevalence of hypertensive retinopathy in hypertensive patients

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ABSTRACT

Hypertension manifests in the eyes as retinopathy, choroidopathy and optic neuropathy of which retinopathy can be used as a predictor for systemic morbidities and mortalities. The objective of the study was to determine the prevalence of retinopathy in hypertensive patients and determine the correlation of retinopathy with parameters like age, sex, duration of hypertension, severity of hypertension and control of hypertension. This was a cross-sectional, retrospective study done in patients attending our hospital between January to March 2019 comprising of 200 patients. The grading of retinopathy was done using Keith-Wagner-Barker system. The presence of retinopathy was compared with parameters like age, sex and duration of hypertension. Statistical analysis was done using MS-Excel and Chi-square test. Among the 200 hypertensive patients (117 males, 83 females), 57 patients had retinopathy (28.5%) of which 35 were males and 22 were females. Among patients with retinopathy, 32 had Grade 1, 16 had Grade 2, 8 had Grade 3 and 1 had Grade 4 retinopathy. Based on the severity of hypertension, 8 out of 61 patients having mild hypertension, 25 out of 81 patients had moderate hypertension and 24 out of 58 patients having severe hypertension, had retinopathy. The prevalence of retinopathy was higher in patients with hypertension for 5 years or more (54.4%) than those with hypertension with less than 5 years (21.8%).Our study showed prevalence of hypertensive retinopathy to be 28.5%. Severity of hypertension and duration of hypertension $\geq$5 years was found to have an association with hypertensive retinopathy.

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INTRODUCTION

Hypertension is a multi-systemic disease affecting more than a hundred crore people leading to an estimated ninety lakh death per year [1]. Various organs are affected by poorly controlled blood pressure like cardiovascular, cerebrovascular, renal and eye, which is referred to as Target Organ Damage (TOD) [2]. Retinal signs points to damage to the retinal microvasculature resulting from elevated blood pressure [3]. The retinal vessels are susceptible as the vascular tone is maintained by auto regulation and the presence of blood-retinal barrier instead of a sympathetic nerve supply [1]. These vascular changes seen in retina may be comparable to the changes noticed in similar sized vessels in other organs [4].

Evidences show that hypertensive retinopathy can be a predictor for systemic morbidities and mortalities [5]. Therefore, owing to the easy accessibility of retinal vessels in routine examination for direct and repeated tests in vivo, deduction can be made as to the changes occurring in the vasculature of

Table 1: Keith, Wagner and Barker classification of hypertensive retinopathy

	Retinal changes
Grade 1	Slight constriction of retinal arterioles, With arteriovenous Ratio of ≥1:2
Grade 2	Grade 1 + focal narrowing of retinal arteriole with an arteriovenous ratio <1:2 or arteriovenous nicking
Grade 3	Grade 2 + flame shaped haemorrhages + cotton wool spots + hard exudates
Grade 4	Grade 3 + optic disc swelling

Table 2: Distribution of retinopathy among various age groups

	18-50 years	51-60 years	61-70 years	>70 years
With retinopathy	14 (21.8%)	18 (29%)	17 (32.7%)	8 (36.3%)
Without retinopathy	50 (78.1%)	44 (70.9%)	35 (67.3%)	14 (63.6%)
Total	64	62	52	22

Table 3: Distribution of retinopathy based on duration of hypertension

	Without retinopathy	With retinopathy	Percentage
≤5 years	64	14	17.94%
>5 years	79	43	35.24%

other systems [4, 6]. Hypertension results in ocular damage in the form of retinopathy, choroidopathy and optic neuropathy [2]. Hypertensive retinopathy encompasses three phases: vasoconstrictive phase, sclerotic phase and the exudative phase [7]. It is often asymptomatic and seldom leads to significant visual loss. However, uncontrolled hypertension can still lead on to vision loss in a short time like in cases of diabetic retinopathy, retinal detachment, retinitis pigmentosa, CRVO, CRAO, age related macular degeneration [2]. Nevertheless, control of blood pressure with medications can have lower incidences of retinal changes when compared to uncontrolled hypertension [8].

Retinopathy changes are observed by fundus examination with direct ophthalmoscope, slit lamp with +90 D lens, or indirect ophthalmoscope [1, 2]. There are numerous grading systems used for hypertensive retinopathy, of which Keith, Wagener and Barker classification system is commonly adopted [1].

Independent association of hypertensive retinopathy with other TOD backs the suggestion of evaluating ocular changes in hypertensive patients in order to improve extra-ocular risk stratification [5]. The presence of retinopathy is found to be influenced by various other factors like gender, smoking, duration of hypertension, severity of hypertension, obesity [4, 9, 10]. This study is done to obtain the prevalence of hypertensive retinopathy and assess the correlation of retinopathy with various parameters like age, sex, severity of hypertension and duration of hypertension.

MATERIALS AND METHODS

These cross-sectional, prospective study consists of hypertensive patients attending our General Medicine outpatient sector between January to March 2019. This study population comprised of 200 hypertensive patients who were examined for hypertensive retinopathy. This was done in both eyes using Fundoscopy by an ophthalmologist. The degree of retinopathy was classified based on the Keith-Wagner-Barker classification as shown in Table 1, [11]. The retinopathy was compared with various parameters like age, sex, duration of hypertension, severity of hypertension and control of hypertension. The blood pressure was classified as: mild hypertension (SBP 120-129 mm Hg/ DBP >80 mm Hg), moderate hypertension (SBP 130-139 mm Hg/ DBP 80-90 mm Hg), severe hypertension (SBP ≥140 mm Hg/ DBP ≥90 mm Hg) [12].

This study adhered to the tenets of the Institutional review board (IRB) and Institutional ethics committee (IEC). Statistical analysis was done using MS-Excel. Additionally, Chi-square test was done to assess the correlation of retinopathy with various parameters like age, sex and duration of hypertension. P-value <0.05 was taken to be significant.

Table 4: Target Organ Damage among patients with retinopathy

Target Organ Damage	Percentage
Ischemic heart disease	38.46%
Stroke	46.15%
Chronic kidney disease	15.38%

RESULTS AND DISCUSSION

Totally, 200 hypertensive patients were examined for hypertensive retinopathy, which consisted of 117 males (58.5%) and 83 females (41.5%) between age group of 18-82. Out of the 200 cases, 57 patients had retinopathy (28.5%), as shown in Figure 1.

According to the hypertension severity, 8 out of the 61 patients having mild hypertension (13.1%), 25 of the 81 patients having moderate hypertension (30.8%) and 24 of the 58 patients having severe hypertension (41.37%), had retinopathy. This is represented in Figure 3. There was a statistical association between retinopathy and severity of hypertension (p=0.002443).

According to Keith Wagener and Barker grading system for hypertensive retinopathy, out of the 57 patients with retinopathy, 32 patients had Grade 1 retinopathy (56.1%), 16 patients had Grade 2 retinopathy (28.1%), 8 patients had Grade 3 retinopathy (14%) and 1 patient had Grade 4 retinopathy (1.7%). The distributions of various grades of retinopathy are represented in Figure 2.

Among the 117 male patients, 35 patients had retinopathy (29.914%) and among the 83 female patients, 22 patients had retinopathy (26.5%) on examination. There was no statistical correlation between the presence of retinopathy and gender (p=0.598787). The distribution of retinopathy among males and females is represented in Figure 4.

The patients were categorised into 4 groups based on their age: group 1 (18-50 years), group 2 (51-60 years), group 3 (61-70 years) and group 4 (>70 years). The percentage of retinopathy was highest among the group 4 population (36.4%).

There was no statistical significance in the distribution of retinopathy among the various age groups (p=0.474713). The distribution of retinopathy among various age groups is shown in Table 2.

Based on the duration of hypertension, the population was divided into two groups with duration of hypertension>5 years and $\leq$5 years.

Of the 78 patients with hypertension for 5 years or less, 14 patients had retinopathy (17.94%) and of

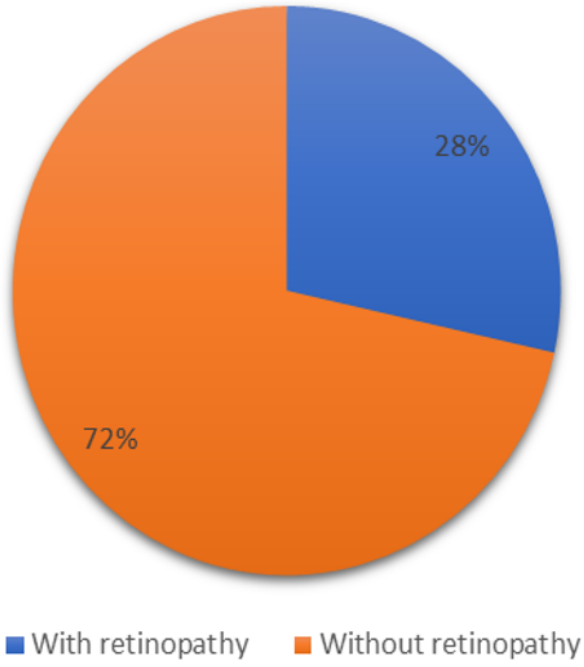

Figure 1: Prevalence of hypertensive retinopathy

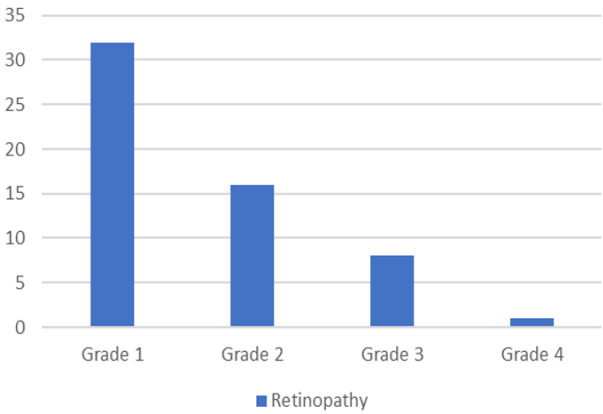

Figure 2: Prevalence of various grades of retinopathy

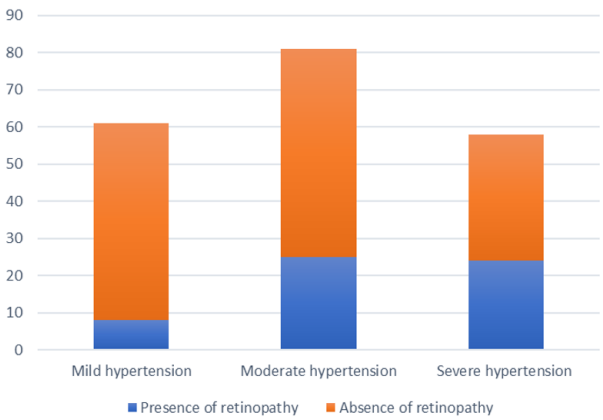

Figure 3: : Distribution of hypertension among screened and those with retinopathy

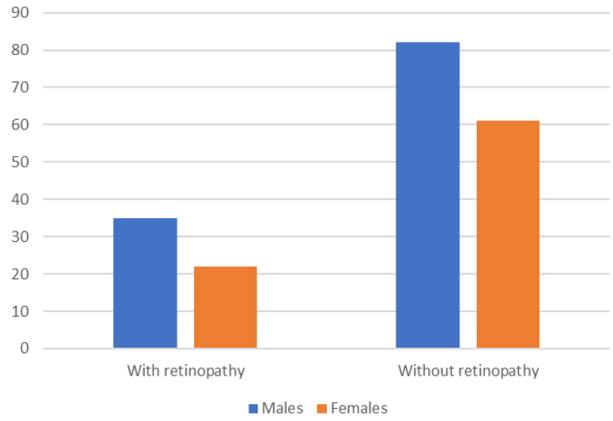

Figure 4: Distribution of retinopathy among males and females

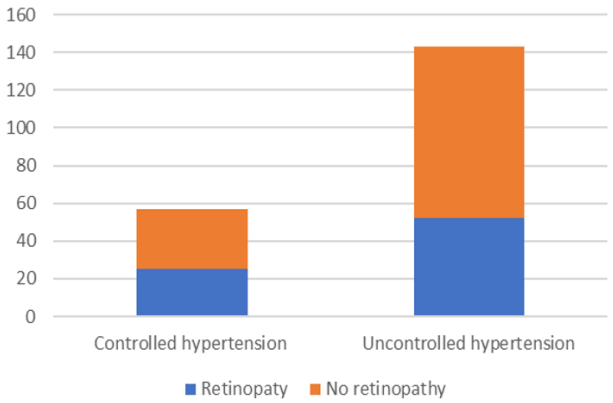

Figure 5: Distribution of retinopathy among controlled and uncontrolled hypertensives

the 122 patients who had hypertension for more than 5 years, 43 patients had retinopathy (35.24%). The prevalence of retinopathy was found to be statistically higher in patients who have had hypertension for more than 5 years when compared to those with hypertension for 5 years or less (p=0.008215). The distribution of retinopathy based on the duration of hypertension is shown in Table 3.

The blood pressure was controlled in 77 patients, of which 25 had retinopathy (32.4%). The blood pressure was uncontrolled in 123 patients, of which 32 had retinopathy (26.01%). This is shown in Figure 5. The prevalence of retinopathy was higher in patients with controlled hypertension than those with uncontrolled hypertension (32.4% vs. 26.01%), but it was not statistically significant (p=0.325385).

About 37 patients had Target Organ Damage (TOD), of which 13 had retinopathy and 24 didn't have retinopathy. The prevalence of TOD was higher in those having retinopathy (22.81% vs. 16.78%), which was not statistically significant (p=0.386236). The various TOD in retinopathy is shown in Table 4.

The effects of chronic hypertension manifests in the eyes as retinopathy, choroidopathy and optic neuropathy, which reflects the vascular changes occurring in other systems [2].

Our study consisted of 200 hypertensive patients of whom 58.5% (117 patients) were males and 41.5% (83 patients) were females. In our study, the prevalence of retinopathy was found to be 28.5%. In a study done by Mondal RN *et al.* (29.4%), similar prevalence was found [10]. However, there was a higher prevalence of hypertensive retinopathy found in other studies, which was highly varied (39.9% - 75%) [3, 4, 9]. This could be due to lower compliance to treatment and lower clinic patient attendance rates.

According to the Keith Wagner and Barker classification, Grade 1 retinopathy was present in the highest frequency (56.1%), followed by Grade 2 (28.1%), Grade 3 (14%) and Grade 4 (1.7%). This pattern of distribution was similar to the study done by Besharati et al. [9] Of the 57 patients with retinopathy, 13.1% having mild hypertension, 30.8% having moderate hypertension and 41.3% having severe hypertension, had retinopathy. There was association of retinopathy with severity of hypertension (p=0.002443). In studies done in India and Bangladesh, males were found to be at an increased risk of developing retinopathy [4, 10]. There was no statistical correlation found between the development of retinopathy and gender in our study (p=0.598787).

We divided the population into various age groups, of which the prevalence of retinopathy was highest in patients >70 years (36.3%) and lowest in patients aged 18-50 years (21.8%). No statistical correlation was found between the various age groups and prevalence of retinopathy (p=0.474713). Singh J et al. found the rates to be lower in the 71-90 age groups (1%) [4]. The prevalence rates seen in studies done by Mondal RN et al. in $\geq$60 years was 39.3% and Besharati in $\geq$70 years is 40.3% showing higher prevalence of retinopathy in elderly, which was similar to our study [9, 10].

We found the prevalence of hypertensive retinopathy to be higher in patients with duration of hypertension more than 5 years (35.24%) than those with hypertension for 5 years or less (17.94%), which was statistically significant (p=0.008215).

The prevalence of hypertensive retinopathy was higher in those with controlled hypertension than those with uncontrolled hypertension (32.4% vs. 26.01%), but this was not statistically significant (p=0.325385). This was similar to the study done on Bangaladesh [10].

The prevalence of target organ damage was higher in those having retinopathy than in those not having retinopathy (22.81% vs. 16.78%). This is similar to the study done by Mondal [10].

Various studies have shown association between hypertensive retinopathy and systemic involvement like cardiovascular morbidities, renal morbidities and organ damage. It would have been interesting to find out the presence of such disease in relation to the grades of retinopathy. However, this was not within the confines of our study. There were some limitations to our study. This study was done in a small population in a small area during a concise timeframe, which may not be applicable to a larger population. Hypertensive patients with other co-morbid conditions were not excluded. Nevertheless, our study did have certain strengths. Among both, the eyes of the patient, which was examined, the one with the worse retinopathy was taken into consideration, which minimised the probability of missing the presence of retinopathy in the patient.

CONCLUSIONS

Our study showed prevalence of hypertensive retinopathy to be 28.5%. Severity of hypertension and duration of hypertension >5 years was found to have an association with hypertensive retinopathy. Further studies are required to explore the association of retinopathy with cardiovascular morbidities, stroke and renal morbidities in hypertensive patients.

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Conflict of Interest

The authors declare that they have no conflict of interest.

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