Prevalence and Risk Factors of Hypertensive Retinopathy in Hypertensive Patients

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Abstract

Background: Hypertensive retinopathy is one of the major complications of hypertension. Presence of hypertensive retinopathy may be an indicator of presence of other complications of hypertension, commonly nephropathy.

Subjects and methods: This study was carried out in OPD of Hypertension and Research Center, Rangpur, Bangladesh. It was a cross sectional study, systemic sampling method was used to generate the sample of 384 patients.

Results: Out of 313 hypertensive patients, male were found preponderance (66.1% vs. 33.9%), mean age was 51.80 years. 29.4% (92) patients had hypertensive retinopathy of different grades. Majority (14.7%) of the patient had grade 1 hypertensive retinopathy. Average time required to develop retinopathy was 6.73 years (minimum 3 month, maximum 30 years). Mean age of the patients with hypertensive retinopathy was 55.10 years. Hypertensive retinopathy was significantly higher in >50 years age than <50 years age (68.48% vs. 31.52%) (P value=0.0004779), male sex (64.1% vs. 35.9%) and higher in those with duration of hypertension more than 5 years (34.56% vs. 23.84%) (P-value=0.0000251). Other target organ damage (IHD, stroke and CKD) was more in those with retinopathy than without retinopathy patients (21.73% vs. 19.90%).

Conclusion: In our study more than one fourth of the hypertensive patients had hypertensive retinopathy. Male sex, increasing age (>60 years) and longer duration of hypertension (>5 years) were positively correlated with hypertensive retinopathy.

Keywords: Hypertensive patients; Retinopathy; Angiography; Cardiovascular risks; Systolic blood pressure; Nephropathy; Chronic renal failure

Introduction

Hypertension affects nearly 26 per cent of the adult population worldwide. Kearney and colleagues estimated that the prevalence of hypertension in 2000 was 26% of the adult population globally and that in 2025 the prevalence would increase by 24% in developed countries and 80% in developing countries [1]. In Bangladesh a nationwide survey in 2010 revealed prevalence of hypertension 17.9% [2]. Hypertension has been reported to be responsible for 57 per cent of all stroke deaths and 24 per cent of all cardiovascular deaths in East Asians [3] Ratindra et al. has shown that 71.2% of the hypertensive patients died due to hypertensive related complications (33.3% due to stroke, 20.3% CAD and 17.8% chronic renal failure) [4]. Because of the high prevalence of this condition and the increased morbidity and mortality associated with this condition, the economic cost of hypertensive disease was estimated at $76.6 billion in 2010 [5]. Eyes are proven hypertensive target organs [6]. The clinical importance of cardiovascular risk factors staging in hypertensive patients is based on retinopathy changes [7]. Some ophthalmoscopic findings are helpful in evaluating the duration, severity, predictions or hypertension vasculopathy effects [8]. Retinal microvascular changes are signs of hypertensive retinopathy and can be useful to classify risk factors and treatment decisions for hypertension [9].

So, earlier detection of hypertensive patients who are in risk to develop target organ damage is very important. In this study we are going to estimate the prevalence and risk factors of hypertensive retinopathy.

Patients and Methods

This was a cross sectional study. Assuming unknown prevalence of hypertensive retinopathy a sample size of 384 (precision of 5% with 95% of confidence level) was calculated. On an average about 30 patients used to come to Hypertension and Research Center, Rangpur daily. From the daily visited patients every 5th patient was taken to generate sample of 384. After initial
evaluation (duration of hypertension, antihypertensive drug use, dietary and lifestyle modification, follow up interval were commonly asked) blood pressure measurement, systemic examination and direct ophthalmoscopic examination was done in every patient by one of the co-author. Before starting the study, ophthalmoscopic examion was done in 20 patients and the findings of the patients were varified by an ophthalmologist. All the ophthalmoscopic examion was done under the supervision of the ophthalmologist. Hypertensive retinopathy was classified according to Keith Wagener Barker (KWB) Grades.

The end point of this study was data collection of 384 patients.

Statistical analysis

The interested variables were processed, edited and analyzed by SPSS windows version 17.0. The socio-demographic data of the study population were expressed in frequency distribution and their observed difference was tested by one sample's t test and 'chi square' test. P value<0.05 was considered as statistically significant with the 95% confidence interval (Table 2). Following are the operational definitions

Hypertension

Systolic blood pressure ≥ 140 mmHg and/or diastolic blood pressure ≥ 90 mmHg (or taking antihypertensive medications) in adults 18 years of age or older.

Classification of hypertensive retinopathy, (Table 1) According to Keith Wagener Barker (KWB) Grades

| Grading | Findings |
|---------|---------|
| Grade 1 | Generalized arteriolar constriction - seen as ‘silver wiring’ and vascular tortuosities |
| Grade 2 | As grade 1 + irregularly located, tight constrictions - Known as ‘(AV) nicking’ or ‘AV nipping’ |
| Grade 3 | As grade 2 + with cotton wool spots and flame-hemorrhages |
| Grade 4 | As above but with swelling of the optic disk (papilledema) |

Table 1: Keith Wagener Barker (KWB) grades.

Data collection

Data was collected from the study population through direct interview and secondary data were taken from their registration book and records. After data collection, data sorting was done, partially filled up data sheet were excluded from the study. Finally we have 313 data sheet for analysis.

Results

Out of 313 hypertensive patients male were found preponderance (66.1% vs. 33.9%). Mean age of the study population was 51.80 years.

| Variables          | Frequency | Percentage (%) |
|--------------------|-----------|----------------|
| Age                |           |                |
| Mean age (SD)      |           |                |
| 51.80 years (SD ± 11.92) |           |                |
| Age range          |           |                |
| 18-90 years        |           |                |
| Sex                |           |                |
| Male               | 207       | 66.10%         |
| Female             | 106       | 33.90%         |
| Occupation         |           |                |
| Housewife          | 100       | 31.90%         |
| Agriculture        | 67        | 21.40%         |
| Business           |           |                |
| Service            | 44        | 14.10%         |

| Monthly income     | Frequency | Percentage (%) |
|--------------------|-----------|----------------|
| <5000 taka*        | 165       | 52.70%         |
| 5001-10000 taka     | 53        | 16.90%         |
| 10001-15000 taka    | 44        | 14.10%         |
| >15000 taka         | 51        | 16.30%         |

Note: *1 dollar = 82 taka

Table 2: Socio-demographic characteristics of the study people at baseline (n=313).

7% (22) patients were smoker at the time of diagnosis of hypertension. But at present 1.3% (1) patient quite smoking, 1.6% (5) patient continued smoking and rest of the patients smoke occasionally.

In our study 29.4% (92) patients had hypertensive retinopathy of different grades (Table 3). Majority of the patient had grade 1 hypertensive retinopathy and grade 4 retinopathy was very minimum 0.3% (1). Average time required to develop retinopathy was 6.73 years (minimum 3 month, maximum 30 years).

| Category | Frequency | Percentage |
|----------|-----------|------------|
| Grade 1  | 46        | 14.70%     |
| Grade 2  | 27        | 8.60%      |

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Mean age of the patients with hypertensive retinopathy was 55.10 years. Prevalence of hypertensive retinopathy was more in male than female (64.1% vs. 35.9%) (P value=0.00652239) and in >50 years age than <50 years age (68.48% vs. 31.52%) (P value=0.0004779) (Table 4).

Table 3: Showing different grades of hypertensive retinopathy (n=92).

| Grade | Number | Percentage |
|-------|--------|------------|
| Grade 3 | 18 | 5.80% |
| Grade 4 | 1 | 0.30% |

Table 4: Showing prevalence of hypertensive retinopathy in both sex and different age group (n=92).

| Age group | Male | Female | Total |
|-----------|------|--------|-------|
| Screened  | Retinopathy | Prevalence | Screened | Retinopathy | Prevalence | Screened | Retinopathy | Prevalence |
| 18-29     | 5    | 1      | 20%   | 2      | 1      | 50%   | 7      | 2      | 28.57%   |
| 30-39     | 35   | 2      | 5.71% | 12     | 1      | 8.33% | 47     | 3      | 6.38%    |
| 40-49     | 44   | 10     | 22.72%| 33     | 9      | 27.27%| 77     | 19     | 24.7%    |
| 50-59     | 60   | 20     | 33.34%| 33     | 13     | 39.40%| 93     | 33     | 35.48%   |
| ≥60       | 63   | 25     | 39.68%| 26     | 10     | 38.46%| 89     | 35     | 39.32%   |
| Total     | 207  | 58     | 28.01%| 106    | 34     | 32.07%| 313    | 92     | 29.40%   |

Table 5: Shows relation of duration of hypertension with hypertensive retinopathy.

| Duration of hypertension | Screened | Hypertensive retinopathy | Prevalence |
|--------------------------|----------|--------------------------|------------|
| 0 - <5 years             | 151      | 36                       | 23.84%     |
| 5 - <10 years            | 81       | 25                       | 30.86%     |
| >10 years                | 81       | 31                       | 38.27%     |

Table 6: Target organ damage among the patients with retinopathy.

| TOD          | Percentages |
|--------------|-------------|
| IHD          | 10.86% (10) |
| Stroke       | 8.69% (8)   |
| CKD          | 9.78% (9)   |

Mean blood pressure of the hypertensive patient was 141.91/88.02 mm of Hg and blood pressure was controlled in 54%. Prevalence of hypertensive retinopathy in controlled hypertensive was 31.36% and in uncontrolled hypertensive was 27.03% (Table 7).

Table 7: Comparison of hypertensive retinopathy with, without retinopathy.

| Name of the drugs | Percentage/frequency | Prevalence of hypertensive retinopathy |
|-------------------|----------------------|---------------------------------------|
| ARB               | 22.04% (69)          | 24.63%                                |
| ACEi              | 1.59% (5)            | 00                                    |
| BB                | 6.70% (21)           | 23.80%                                |
| CCB               | 4.47% (14)           | 35.71%                                |
| Diuretic          | 0.95% (3)            | 33.33%                                |

In our study combined ARB and diuretics was the maximum used antihypertensive drugs (22.4%) followed by ARB alone (22%) (Drug history includes all the drugs taken by the patient along the whole duration of hypertension). Among the different antihypertensive users, prevalence of hypertensive retinopathy was higher among those used ARB + BB (Table 8).
Table 8: Showing the antihypertensive drug used by the patients and prevalence of hypertensive retinopathy.

| Drug Combination | Grade 1 (%) | Grade 2 (%) |
|------------------|-------------|-------------|
| ARB + BB         | 14.5% (13)  | 69.23%      |
| ARB + BB + CCB   | 3.83% (12)  | 41.66%      |
| ARB + BB + CCB + Diuretic | 1.59% (5) | 20%         |
| BB + CCB         | 9.58% (30)  | 20%         |
| CCB + D          | 0.31% (1)   | 0%          |
| ARB + CCB        | 12.77% (40) | 35%         |
| ARB + Diuretic   | 22.36% (70) | 30%         |
| ARB + BB + Diuretic | 1.59% (5) | 0%          |
| ARB + CCB + Diuretic | 3.19% (10) | 20%         |

Discussion

In our study we have found prevalence of hypertensive retinopathy was 29.9%. Other studies [10,11] also found similar prevalence of hypertensive retinopathy (30.6% to 33.9%). In a study performed in 2001 on 800 hypertensive patients, the prevalence of grade 1 and grade 2 retinopathies among hypertensive patients was 46% and 32%, respectively, and only a few patients (<2%) showed grade 3 and grade 4 abnormalities [12]. In our study we have also found similar result, grade 1 hypertensive retinopathy was maximum (14.7%) and grade 4 hypertensive retinopathy was minimum (0.3%). Grading of hypertensive retinopathy has prognostic significance. 70% of the grade 1 hypertensive retinopathy patients survived for 3 years which is only 6% in those with grade 4 retinopathy [13]. Hypertensive persons whose blood pressure was uncontrolled more likely to develop retinopathy than individuals whose blood pressure was controlled with medication [14,15]. But in our study hypertensive retinopathy was higher in controlled blood pressure patients (31.36% vs. 27.03%). This may be due to high control blood pressure in our study, blood pressure was control in 54% of the patients. Though many other studies did not find any relation of hypertensive retinopathy with duration of hypertension, hypertensive retinopathy was higher in those with duration of hypertension more than 5 years.

Hypertensive retinopathy of any grade have moderate accuracy in predicting microalbuminuria and hence can be used as a cost-effective screening tool to predict microalbuminuria especially in a resource-poor setting [16]. In our study, among the patients with retinopathy only 10.86% had IHD, 8.69% had history of stroke and 9.78% patients had CKD. These findings may be due to inadequate assessment of the target organ damage. Yu T, et al. [17] showed that retinopathy is correlated with increased age and existence and severity of hypertension, whereas no correlation was found with hypertension duration. In our study we have found that male sex, increasing age (>60 years) and longer duration of hypertension (>5 years) were positively correlated with hypertensive retinopathy.

Conclusion

In our study we have found one fourth of the hypertensive patients had hypertensive retinopathy. Male sex, increasing age (>60 years) and longer duration of hypertension (>5 years) were positively correlated with hypertensive retinopathy.

Limitation

Beside Retinopathy other Target organ damage and its co-relation with TOD were not assessed.

Future Direction

Comparison of ophthalmoscope, fundal photograph and retinal angiography in detection of hypertensive retinopathy and its co-relation with target organ damage can be studied.

Conflict of Interest

There was no conflict of interest.

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Contributions by the Authors

Dr. Ratindra Nath Mondal planned and supervised the study. Dr. Md. Abdul Matin analysed Data. Dr. Moni Rani helped to collect the data. Professor Dr. Md. Zakir Hossain, Professor Dr. Amaresh Chandra Shaha, Professor Ram B. Singh, Dr. Md. Foyjul Islam, Dr. Anupom Das helped in writing of the manuscript and presentation of the data.
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