Severity of Retinopathy in PIH Patients Attending the Tertiary Care Center of South Gujarat: A Cross-Sectional Study

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Abstract:

Introduction: Pregnancy induced hypertension (PIH) is a major public health concern as it raises foetal and maternal mortality and morbidity. Hypertension in pregnancy causes vascular alterations in retinal vessels. So, retinal examination in pregnant females reflects information regarding foetal well-being and placental circulation status.

Material and Method: The study was based on cross-sectional study design. 88 pregnant females attending a tertiary care center of South Gujarat, India from October 2020 to August 2021 were taken as participants. Visual acuity was assessed by Snellen's chart and severity of retinopathy was graded based on Keith wagener and barker classification. For all statistical tests, p-value <0.05 was considered statistically significant.

Result: The association of retinopathy with age, vision, gravida status, proteinuria and severity of disease was non-significant. Retinopathy was maximally seen in 20-25 years age group, primigravida, eclampsia patients and patients with proteinuria++. Grade II retinopathy was the most common retinopathy found. The association of severity of retinopathy with visual acuity was significant however it was non-significant with age, gravida status, proteinuria and severity of disease.

Conclusion: Routine ophthalmoscopy must be done in PIH females specifically to know retinal vasculature condition and placental vasculature in general. This will prevent maternal and foetal morbidity and mortality by their timely diagnosis and management of complications.

Keywords: Pregnancy, PIH, Retinopathy, Severity etc.

Introduction

Pregnancy is a physiological condition during which body of a female may show many pathological and physiological changes and the frequently observed variation is pregnancy induced hypertension (PIH).[1] In PIH, the female experiences hypertension along with generalized edema with or without proteinuria occurring after 20 weeks of conception with no other prominent basis of increased blood pressure (BP). PIH is further classified as gestational hypertension, preeclampsia and eclampsia based on related features.[2] BP >140/90mmHg without proteinurea is categorized as Gestational Hypertension, BP ≥140/90mmHg with proteinurea (≥300mg/24hours) is pre-eclampsia and beginning of convulsions with pre-eclampsia in a female without any other associated reason is categorized as eclampsia.[3]

PIH is a major public health concern as it raises foetal and maternal mortality and morbidity.[4] In developing countries like India and Pakistan, PIH is one of the major reason for maternal deaths[5] and attributes to 10 to 15% of worldwide maternal deaths.[6] According to WHO, hypertensive illness in pregnancy results in 14% of maternal deaths.[7] Pathophysiology of PIH is based on vascular endothelial alterations along with generalized vasospasm & leakage of capillary.[8] This emphasizes the call for early prediction of PIH. [9] Since hypertension in pregnancy involves almost all the vessels of body so these vascular alterations are likely to affect the retinal vessels. Retina is the only site in an individual where we can visualize blood vessels directly with the aid of an ophthalmoscope. Therefore evaluation of vascular alterations and retinal examination in pregnant

female can serve as a window to assess information regarding foetal well-being and placental circulation status.[10] Depending on severity of vascular changes in retina, the severity of retinopathy is graded into 4 grades i.e. grade I, II,II and IV. The most frequent alteration found is attenuation of small retinal blood vessels particularly arterioles. All these vascular alterations are reversible and revert back to normal after delivery.[11] This research was conducted to evaluate the severity of retinopathy in PIH patients and to assess the association of severity of retinopathy with other parameters.

Material and Method

Our research was based on cross-sectional study design. 88 pregnant females fulfilling inclusion criteria, attending a tertiary care center of South Gujarat, India from October 2020 to August 2021 duration were taken as participants of the study. Informed consent from the patients or their husband was taken after obtaining ethical clearance from the Institutional ethics committee. All the PIH patients with gestational age ≥20 weeks, irrespective of the stage of hypertension were enrolled in the study. The patients with the history of diabetes mellitus (DM), connective tissue disease, chronic kidney disease (CKD), heart diseases, ocular disease like high myopia, glaucoma, ocular trauma, cataract, corneal opacity, ocular surgery, severe anaemia, hypertension, seropositive patients and who were not willing to participate were excluded from the study. All the parameters like age, BP, proteinuria, gravid status, vision, severity of retinopathy and severity of disease were assessed. Average of 3 peak readings of BP of patients was taken. Proteinuria was checked by dip stick method. Visual acuity was assessed by Snellen's chart and 6/9 or better was considered normal. Severity of retinopathy was graded based on Keith wagener and barker classification. All the assessed data was noted on a pre-formed proforma and statistical analysis was done using SPSS software version 20. For all statistical tests, p-value <0.05 was considered statistically significant.

Result

Our study was comprised of 88 patients with age from 17- 42 years and mean age of 23.47 ±4.0 years. According to age, patients were divided into 4 groups as visible in figure1 i.e. ≤19 years, 20-25 years, 26-30 years and ≥30 years comprising 13 (14.77%), 54 (61.36%), 16 (18.19%) and 5 (5.68%) cases respectively.
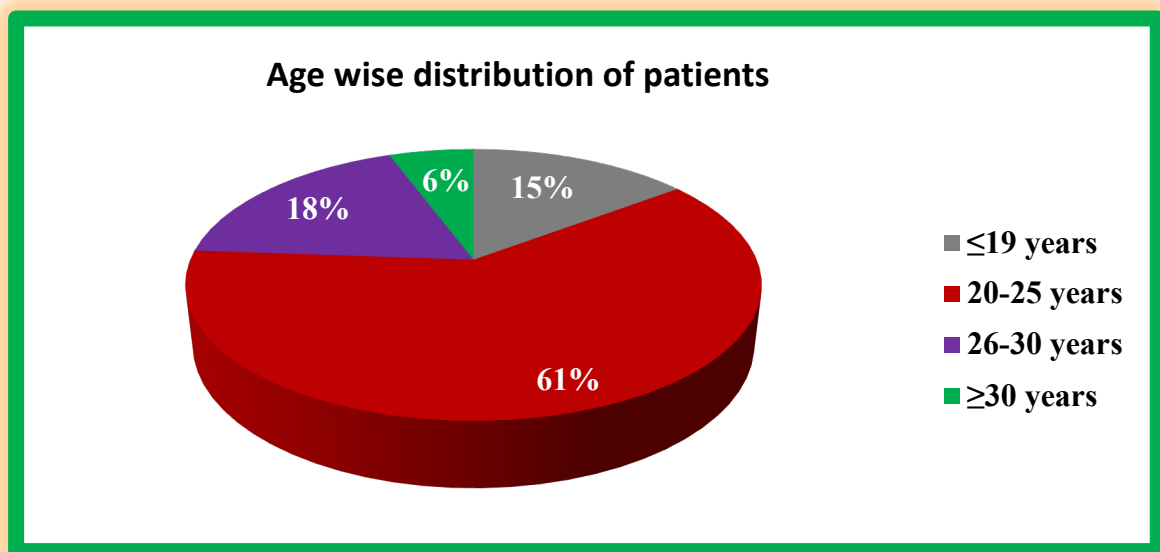

Figure 1: Age wise distribution of patients

As can be seen in table 1, out of 88 patients, 29 showed no retinopathy and 59 had retinopathy changes. Among different age groups of patients (≤19 years, 20-25 years, 26-30 years and >30 year) 9, 37, 9 and 4 had retinopathy respectively. Out of 59 patients with retinopathy, 24 (27.27%) had grade I, 30 (34.09%) had grade II, 2 (2.27%) had grade III and 3 (3.40%) had grade IV hypertensive retinopathy according to KW and Barker classification. Further PIH patients were categorized according to gravida status. 41 (46.59%) were primigravida, 46 (50%) multigravida and 3 (3.40%) were grand multigravida comprising 30, 28 and 1 patients with retinopathy respectively. Table 1 also shows SBP (systolic BP) and DBP (diastolic BP) of PIH patients. 70 patients had SBP <160 mmHg and 18 had >160 mmHg correspondingly including 45 and

14 patients with retinopathy. Further 80 PIH patients had DBP <110 mmHg and 8 had >110 mmHg including 55 and 4 patients having retinopathy. Additionally, 58 patients out of total 88 had proteinuria and these patients were sorted into 5 groups based on proteinuria i.e.nil, +, ++, +++ and ++++ comprising 8, 19, 34, 23 and 4 patients respectively and out of which correspondingly 6, 13,22,15 and 3 had retinopathy. Age, proteinuria, vision, gravida status and severity of PIH were not found to be significantly associated with retinopathy.

Table 1: Distribution of patients according to different parameter based on retinopathy

Parameter		With Retinopathy	Without Retinopathy	p-value
Age	≤19 years	9	4	0.728
	20-25 years	37	17	
	26-30 years	9	7	
	>30 years	4	1	
Grade of Retinopathy	Grade I	24	0	-
	Grade II	30	0	
	Grade III	2	0	
	Grade IV	3	0	
Gravida status	Primigravida (1)	30	11	0.290
	Multigravida (2-4)	28	16	
	Grand multigravida (>4)	1	2	
Vision	6/6-	54	29	0.456
	6/9-	3	0	
	FC<1 meter	1	0	
	FCCF	1	0	
Proteinuria	Nil	6	2	0.976
	+	13	6	
	++	22	12	
	+++	15	8	
	++++	3	1	
Severity of disease	GHT	3	3	0.477
	Mild pre eclampsia	25	6	
	Severe pre-eclampsia	4	10	
	Eclampsia	27	10	

Figure 2 clearly depicts the patient distribution based on severity of disease, 6 had gestational hypertension (GHT), 31 had mild preeclampsia, 14 had severe preeclampsia and 37 had eclampsia encompassing 3,25,4 and 27 patients with retinopathy consecutively.
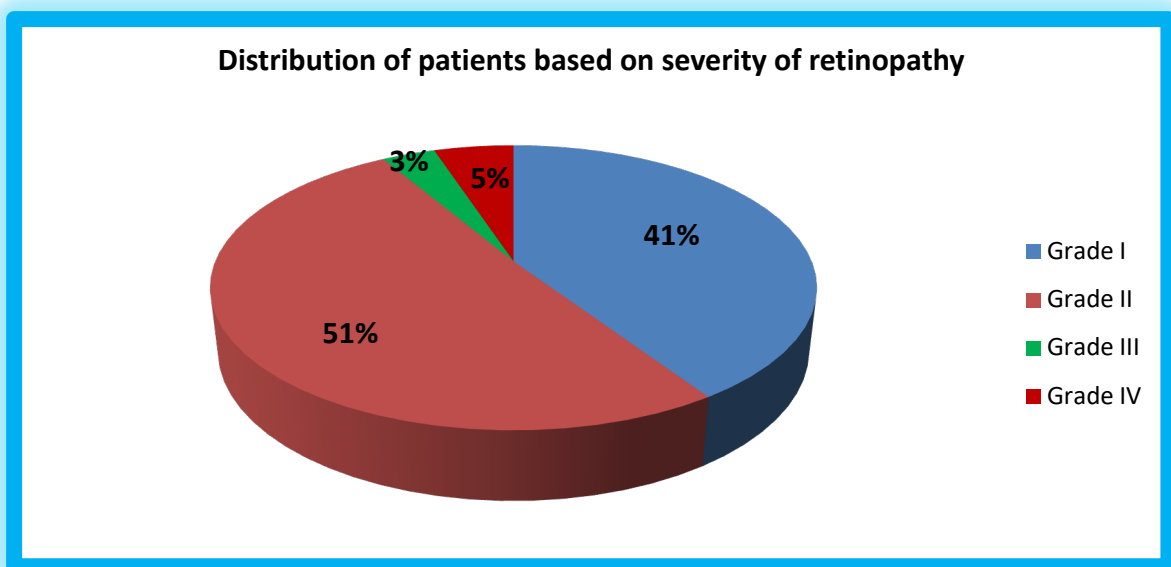

Figure 2: Distribution of patients based on severity of retinopathy

Table 2 shows no significant association of age groups with severity of retinopathy. In ≤19 years age, 3,5 and 1 patients of grade I,II and III were observed respectively. Age group 20-25 years age had 18 patients of grade I, 17 patients of grade II and 1 patient of grade III and IV each. Age group 26-30 years was comprised of 1 patients of grade I, 5 of grade II and 1 patient of grade IV. Age group >30 years included 3 patients of grade II and 1 patient of grade IV.

Table 2: Associations between age group and severity of disease

Age group	Severity of Retinopathy				p-value
	Grade I	Grade II	Grade III	Grade IV	
≤19years	3	5	1	0	0.436
20-25 years	18	17	1	1	
26-30 years	3	5	0	1	
>30 years	0	3	0	1	

Table 3 shows association of severity of PIH with severity of retinopathy. In our study group of GHT patients had 1 patient of grade 1 and 2 patients of grade II. Mild pre-eclampsia group comprised 13 patients of grade 1 and 12 patients of grade II. Severe pre-eclampsia was seen in 1 patient of grade I and 3 patients of grade II. Eclampsia group had 9,13,2 and 3 patients. Of grade I, II, III and IV respectively. The association of severity of disease with severity of retinopathy was also found to be non-significant.

Table 3: Association between severity of disease and severity of retinopathy

Severity of disease in PIH	Grade of Retinopathy				p-value
	Grade I	Grade II	Grade III	Grade IV	
GHT	1	2	0	0	0.665
Mild preeclampsia	13	12	0	0	
Severe pre eclampsia	1	3	0	0	
Eclampsia	9	13	2	3	

Table 4 depicts gravid status of PIH patients along and their association with severity of retinopathy in PIH patients. Out of 41 primigravida patients in our research, 10,17,2, and 1 patients showed grade I, II, II and IV respectively. Multigravida patients had 2 patients of grade 4 and 13 of grade I and II each. Grand multigravida subjects had only 1 patient who showed grade I. The association of gravida status with severity of retinopathy was also non- significant.

Table 4: Associations between gravida status and severity of retinopathy

Gravida status	Severity of retinopathy				p-value
	Grade I	Grade II	Grade III	Grade IV	
Primigravida	10	17	2	1	0.582
Multigravida	13	13	0	2	
Grand multigravida	1	0	0	0	

Table 5 shows association of vision and severity of retinopathy. Patients with vision 6/6 included 23,28,2 and 1 patients with grade I, II, III and IV retinopathy respectively. Vision 6/9 patient group had 1 patient of grade I and 2 patients of grade II retinopathy. Patients with vision FC < 1meter and FCCF had only 1 patient of grade IV.

Table 5: Association between vision and severity of retinopathy

Vision	Severity of retinopathy				p-value
	Grade I	Grade II	Grade III	Grade IV	
6/6-	23	28	2	1	**0.001**
6/9-	1	2	0	0	
FC < 1meter	0	0	0	1	
FCCF	0	0	0	1	

Table 6 illustrates level of proteinuria. 4 patients of grade I and 2 patients of grade II had no proteinuria. Proteinuria + was seen in 7 patients of grade I, 5 of grade II and 1 patient of grade IV. Proteinuria ++ was noted in 8,12 and 2 patients of grade I,II and grade IV consecutively. Proteinuria +++ was observed in 4 patients of grade I, 10 of grade II and 1 patient of grade III. Proteinuria ++++ was seen in 24,30,2 and 3 patients of grade I,II,II and IV respectively. The association between proteinuria and severity of retinopathy was also found to be non-significant.

Table 6: Associations between proteinuria and severity of retinopathy

Proteinuria	Severity of retinopathy				p-value
	Grade I	Grade II	Grade III	Grade IV	
Nil	4	2	0	0	
+	7	5	0	1	
++	8	12	0	2	0.346
+++	4	10	1	0	
++++	1	1	1	0	

Discussion

PIH is one of the most frequent complications encountered in obstetrics. Maternal mortality in eclampsia patients in India ranges from 2-30%.[12] But, if appropriate and early management of PIH is done then mortality rate can fall to <2%.[13] The present study was conducted on 88 PIH patients and the occurrence of retinopathy was seen in 59 patients. The mean age in our study was 23.47±4 years with age ranging from 17- 42 years which is in concordance with study by Muhammad Imran et al.[14] The patients were divided 4 groups based on their age i.e. ≤19, 20-25, 26-30 and >30 years. Although age group 20-25 years had more retinopathy patients than other age groups, the association of age with retinopathy in PIH patients was not significant in our study. This outcome is nearly in agreement with study by Mandar zade et al.[15] and Shah AP et al.[8] as they also found non-significant association between age and retinopathy and the maximum retinopathy patients in 20-29 years age group.

Our research noted almost equal distribution of retinopathy among primigravida and multigravida PIH females with least number in grand mutigravida. This association of gravida status with retinopathy in PIH patients was also not significant and these findings are also in harmony with study by Mandar zade et.al et al.[15] Shah AP et al.[8] found more retinopathy patients in mutigravida PIH females although they also found the association to be non-significant. As far as proteinuria is concerned, majority of the retinopathy patients had proteinuria ++ which is in agreement with findings of Uwagboe PN et al.[16] and Aishwarya R M et al.[17] The association of proteinuria with retinopathy in PIH patients was also not significant in our study.

This in diaparity with study by Muhammad Imran et al.[45], Shah AP et al.[8] and Mandar zade et al.[15] as they found significant association of retinopathy with proteinuria. The bulk of retinopathy patients in current research had normal visual acuity i.e. 6/6 which is in conformity with study by Aishwarya R M et.al[17] Based on severity of disease, PIH patients were categorized into 4 groups and retinopathy was maximally seen in mild pre-eclampsia group. This outcome is in accordance with outcomes of Uwagboe PN et al.[16] but is in contrast to study by Renuka Nilesh

Patil et al.[18] as they observed retinopathy to be common among severe pre-eclampsia patients. The association of severity of disease with retinopathy was not significant in present study. As far as severity of retinopathy is concerned, majority of patients of current research had grade II retinopathy followed by grade I. This finding is in disagreement with previous studies [14,18,15] as they found grade I retinopathy to be more communal followed by grade II.

Further we have seen association of severity of retinopathy in PIH patients with other parameters. The association of age with severity of retinopathy was not significant in our study and the age group 20-25 years had almost equal number of patients in grade I and grade II. This outcome is in disparity with study by Uwagboe PN et al.[16] as they found PIH to be prevalent in age group 31-35 years with patients mainly having grade I retinopathy followed by grade III and they observed significant association between age and severity of retinopathy. Then we assessed association between severity of retinopathy and severity of disease and it was also found to be non-significant.

However mild pre-eclampsia patients had majority of them in grade I and eclampsia patients in grade II which is also not in agreement with study by Uwagboe PN et al.[16] as they found significant association and majority of eclampsia patients to have grade III. Study by Renuka Nilesh Patil HT [18] is also not in harmony with our results as they also found significant association between severity of retinopathy and severity of PIH with majority of severe pre-eclampsia patients to fall in grade I followed by mild pre-eclampsia with grade II.

Another study by Muhammad Imran Janjua et al.[14] found majority of GHT patients with grade I followed by grade II retinopathy. We also observed association between severity of retinopathy and gravida status and it was also found to be non-significant. Primigravida patients mainly had grade II retinopathy followed by mutigravida subjects having grade I and II retinopathy. This finding is strongly supported by Uwagboe PN et al.[16] as they also found association among severity of retinopathy and gravida status to be non-significant although they observed primi and mutigravida patients to have mainly grade III retinopathy. Study by Muhammad Imran Janjua et al.[14] found this association to be significant with grade I and II

in mutigravida subjects to be more prominent followed by grade II in primigravida. Further our study documented significant association between vision and severity of retinopathy which is strongly supported by Uwagboe PN et al.[16] Additionally we observed association of proteinuria with severity of retinopathy to be non-significant. Majority of patients with proteinuria ++ had grade II retinopathy, followed proteinuria +++ patients. However these outcomes are in disparity with study by Muhammad Imran Janjua et al.[14] as they found maximum patients without proteinuria in grade I followed by grade II and the association among proteinuria and severity of retinopathy was significant. Study by Uwagboe PN et al. [16] also found association to be significant and proteinuria+++ cases maximally to have grade III.

Conclusion

A range of ocular and retinal variations occurs in PIH. Our study concluded that the existence of retinal variations is related to visual acuity, severity of disease, proteinuria and gravida status. Any alteration in the retinal vasculature possibly will also imitate a related disease in the placental microcirculation and predict foetal prognosis. So one of the vital requisite in PIH is fundoscopic examination of retina and routine ophthalmoscopy must be done in PIH females specifically to know retinal vasculature condition and placental vasculature in general. This will prevent maternal and foetal morbidity and mortality by their timely diagnosis and management of complications.

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