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Retinal Manifestations During Severe Pre-Eclampsia / Eclampsia at Gabriel Toure Chu

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Abstract: Introduction: Preeclampsia is a major public health concern. It is a systemic disorder that can affect multiple organs, including the eyes. The objective of this study was to assess retinal manifestations in severe preeclampsia/eclampsia in order to highlight the importance of ophthalmic monitoring in patients with this condition. Materials and Methods: We conducted a prospective study involving 342 patients diagnosed with preeclampsia or eclampsia, admitted between September 2022 and February 2023, over a 5-month period, in two university teaching hospitals in Bamako. Results: The mean age of the patients was 25.62 ± 7.062 years. Most of them (74.9%) had no prior history of arterial hypertension. In nearly 70% of cases, the pregnancies were not at term at the onset of preeclampsia or eclampsia. Blurred vision was the most frequently reported ophthalmic symptom. Retinal abnormalities were observed in 48.2% of right eyes and 47.1% of left eyes, including: 4 cases (2 OD, 2 OS) of serous retinal detachment; 2 cases (1 OD, 1 OS) of hypertensive choroidopathy; 1 case of left-eye branch retinal vein occlusion (BRVO) and 18 cases (10 OD, 8 OS) of grade III hypertensive retinopathy with optic disc edema. Discussion: The presence of retinal lesions appears to be a marker of severity in eclampsia, and their early detection enables prompt and appropriate management, thereby improving maternal and fetal outcomes. Conclusion: Fundus examination should be routinely included in the management of preeclampsia and eclampsia.

Keywords: Preeclampsia, Eclampsia, Hypertensive Retinopathy, Pregnancy.

INTRODUCTION

L'éclampsie Eclampsia is defined as the occurrence of one or more generalized convulsive seizures and/or altered consciousness that cannot be attributed to a pre-existing neurological disorder [1]. It may occur during pregnancy after the 20th week of amenorrhea, during labor, or in the postpartum period [2]. It represents one of the complications of preeclampsia, which is defined by the World Health Organization (WHO) as the association of arterial hypertension and proteinuria exceeding 300 mg/24 hours, or greater than 2+ on urinary dipstick testing, occurring after the 20th week of amenorrhea, with or without lower-limb edema [2].

Preeclampsia constitutes a major public health problem; it is the third leading cause of maternal mortality and the leading cause of perinatal mortality worldwide [3,4]. In West Africa, it accounts for an average of 12.7% of maternal deaths during pregnancy [5]. The preeclampsia/eclampsia syndrome is a multisystemic disorder that can induce various ocular complications involving multiple segments of the eye [6]. Among women with preeclampsia/eclampsia, many develop ocular complications such as hypertensive

retinopathy, retinal detachment, or vitreous hemorrhage[7]. Exudative (or serous) retinal detachment occurs in fewer than 1% of patients with preeclampsia and in 10% of those with eclampsia[8].

In Mali, at the Sominé Dolo Hospital in Mopti, Sankaré et al. reported that patients with preeclampsia presented fundoscopic lesions in 63.9% of cases, compared with 36.1% among eclamptic patients, with a perinatal mortality rate of 23.5% [9]. Given the frequency of the condition and the lack of data regarding ocular complications associated with this severe pathology in our setting (CHU Gabriel Touré), it seemed appropriate to undertake this study to strengthen and update the available data in Mali.

MATERIALS AND METHODS

This study was conducted jointly at the Institute of Tropical Ophthalmology of Africa (IOTA) and the Gynecology-Obstetrics Department of the Gabriel Touré University Teaching Hospital. It was a cross-sectional study with prospective data collection, carried out from September 2022 to February 2023.

The sample size was calculated using the Schwartz formula: $N = z^2 \times p(1 - p) / m^2$, based on the study by Diallo et al. [2], who reported a 32.3% prevalence of fundus lesions. Assuming a 5% precision around our point estimate, we needed to include at least 336 cases of preeclampsia/eclampsia ($N = 1.96^2 \times 32.3 \times 67.7 / 5^2 = 336.01$).

The study population consisted of all women referred to CHU-IOTA by the Obstetrics Department of CHU Gabriel Touré for ophthalmologic evaluation in the context of severe preeclampsia or eclampsia. Pregnant women with documented hypertension predating pregnancy, those with media opacities, and those who did not provide informed consent were excluded. We carried out systematic recruitment of all patients meeting the inclusion criteria after obtaining free and informed consent. A structured questionnaire was administered to all patients with severe preeclampsia or eclampsia referred to CHU-IOTA for fundus examination during the study period. The questionnaire collected sociodemographic data, obstetric findings, ophthalmologic examination findings, and complementary investigations (non-mydriatic fundus photography, OCT).

RESULTATS

At the end of our study (September 2022 to February 2023), a total of 1,925 hospitalizations were recorded in the Obstetrics Department of CHU Gabriel Touré. Among these, 467 cases of severe preeclampsia or eclampsia were identified, representing 24.26%. We included 342 patients who met the inclusion criteria and consented to participate.

The mean age was 25.6 ± 7 years, with extremes ranging from 15 to 45 years. The most represented age group was 20–24 years (26.3%) (see Figure 1). Patients were unschooled in 34.8% of cases, married in 90.1%, and the majority (71%) were housewives. Bamako was the place of residence for 90.1% of them. Most patients (94.4%) had no significant medical history (see Table I). Primigravidas and nulliparous women were the most represented, with 36.5% and 40.4%, respectively. No associated pregnancy-related conditions were reported in 74.9%, and 97.1% had no ophthalmologic history. Emergency referral was the most common mode of admission (59.9%).

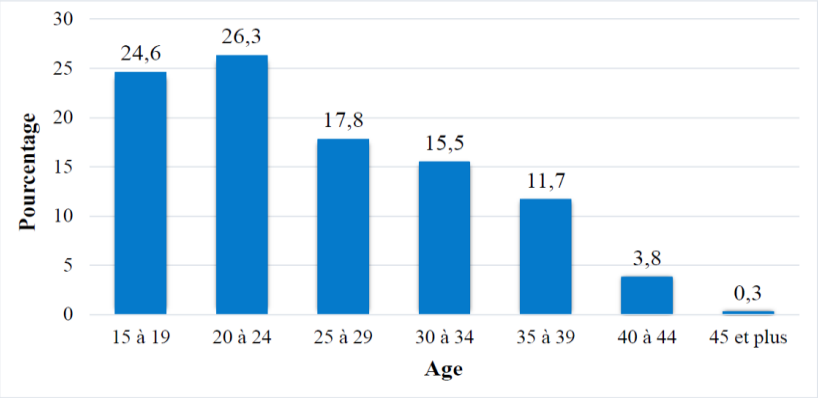

Figure 1: Distribution of patients according to age group

Table I: Distribution of patients according to medical history

ATCD médicaux généraux	Effectif	Pourcentage (%)
Néant	323	94,4
Asthme	7	2,0
Drépanocytose	4	1,2
Diabète	3	,9
AgHBS+	2	,6
Autres*	4	0,12
ATCD obstétricaux		
Gestité		
primigeste (1)	125	36,5
paucigeste (2-4)	120	35,1
multigeste (5-7)	70	20,5
grande multigeste (≥8)	27	7,9
Parité		
Nullipare	138	40,4
Paucipare (2-4)	97	28,4
Multipare (5-7)	57	16,7
Primipare (1)	41	12,0
Grande multipare (≥8)	9	2,6
ATCD de pathologies associées à la grossesse		
Néant	256	74,9
HTA/Grossesse	45	13,2
Avortement	32	9,4
Anémie	4	1,2
Béances cervicales	3	0,9
Iso-immunisation rhesus	1	0,3
Diabete gestationel	1	0,3
ATCD ophtalmologiques		
Néant	332	97,1
Amétropie	7	2,0
Ptosis	2	0,6
Strabisme	1	0,3

*= Anémie, Cardiopathie, Goitre, Lymphoedeme.

Grade III hypertension was the most frequent (68.7%), and proteinuria was ≥ 3+ in 62.3% of cases. The level of consciousness was normal in the majority (79.5%) of patients. Headache was the most frequent presenting symptom (70.8%), and blurred vision was the most commonly reported visual complaint (22.8%). More than half of the patients (52%) received adequate antenatal care with at least four ANC visits. Gestational age was below 37 weeks in 68.7%, and pregnancies were singleton in 96.5% of cases.

Severe preeclampsia was the most common diagnosis (67.3%) compared with eclampsia (32.7%) (see Figure 2). Abruptio placentae complicated 18.4% of pregnancies, and intrauterine growth restriction (IUGR) was observed in 35.8% of fetuses. Cesarean section was the most frequent mode of delivery (61.7%), and 41.7% of live births were premature.

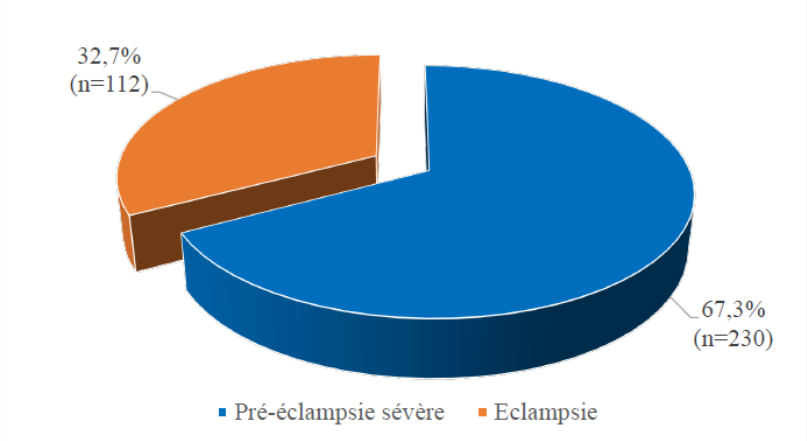

Figure 2: Distribution of patients according to age group

Visual acuity was ≥ 3/10 in both eyes (91.2% OD, 92.4% OS) (see Table II). Hypertensive retinopathy was observed in 48.2% of right eyes and 47.1% of left eyes (see Table III).

Table II: Distribution of patients according to uncorrected distance visual acuity in both eyes, based on the WHO classification of visual impairment

Uncorrected Distance Visual Acuity	OD		OG	
	Effectif	%	Effectif	%
AVL≥3/10	312	91,2	316	92,4
3/10<AVL<1/20	24	7,0	23	6,7
AVL≤1/20	6	1,8	3	0,9
Total	342	100,0	342	100,0

Table III: Distribution of eyes according to the presence of hypertensive retinopathy

Hypertensive Retinopathy	OD		OG	
	Effectif	%	Effectif	%
Yes	**165**	**48,2**	**161**	**47,1**
Non	177	51,8	181	52,9
Total	342	100,0	342	100,0

Among eclamptic patients, hypertensive retinopathy was present in 55.4% of both eyes, compared with 44.8% (OD) and 43.0% (OS) in preeclamptic patients (see Table IV). According to the Kirkendall classification, Stage I hypertensive retinopathy was the most frequent in both eyes (see Table V).

Table IV: Distribution of hypertensive retinopathy according to the clinical diagnosis

Rétinopathie hypertensive	Diagnostic				Total	
	PES		Eclampsie			
	Eff	%	Eff	%	Eff	%
Yes	**105**	**45,7**	**62**	**55,4**	**167**	**48,8**
No	125	54,3	50	44,6	175	51,2
Total	230	100	112	100	342	100

PES= Pré-éclampsie Sévère

Table V: Distribution of eyes according to the Kirkendall classification

Kirkendall's classification	OD		OG		Total	
	Ef	(%)	Ef	(%)	Ef	(%)
Grade I	178	52,0	182	53,2	360	105,2
Grade I	77	22,5	74	21,6	151	44,1
Grade II	66	19,3	70	20,5	136	39,8
Grade III	21	6,1	16	4,7	37	10,8
Total	342	100	342	100	684	200

Macular edema was the most common fundoscopic complication (10 cases OD and 5 cases OS, i.e., 2.9% and 1.5%, respectively), followed by serous retinal detachment (1.6%) and hypertensive choroidopathy (1.6%) (see Table VI).

A statistically significant association was found between the occurrence of retinopathy and the severity of hypertension in both eyes (p = 0.011 OD, p = 0.001 OS) (see Table VII).

No relationship was found between hypertensive retinopathy and proteinuria (p = 0.242 OD, p = 0.133 OS), nor with the mode of delivery (p = 0.964 OD, p = 0.941 OS).

Tableau VI : Répartition des yeux selon les complications de la rétinopathie hypertensive

Complications of hypertensive retinopathy	OD		OG	
	Eff	%	Eff	%
None	327	95,6	333	97,3
Macular edema	10	2,9	5	1,5
DSR	2	0,6	2	0,6
Hypertensive choroidopathy	2	0,6	2	0,6
OBVR	1	0,3	0	0,0
Total	342	100	342	100

Tableau VII : Relation entre la rétinopathie hypertensive et le Grade de l'HTA

GRADE HTA	RHTA+		RHTA-		
	Effectif	%	Effectif	%	
Grade I	10	6,1	15	8,5	
Grade II	26	15,8	33	18,6	
Grade III	**125**	**75,8**	111	62,7	OD
Hypotension	4	2,4	18	10,2	
Khi²=11,163 ; p=0,011					
Grade I	8	5,0	17	9,4	
Grade II	25	15,5	34	18,8	
Grade III	**125**	**77,6**	111	61,3	OG
Hypotension	3	1,9	19	10,5	
Khi²=15,965 ; p=0,001					

Figure 3: Non-mydriatic fundus photographs (OD and OS) of a 17-year-old patient hospitalized at Gabriel Touré University Hospital for eclampsia, showing cotton-wool spots and both superficial and deep flame-shaped hemorrhages in both eyes: Stage II hypertensive retinopathy according to Kirkendall (OD and OS).

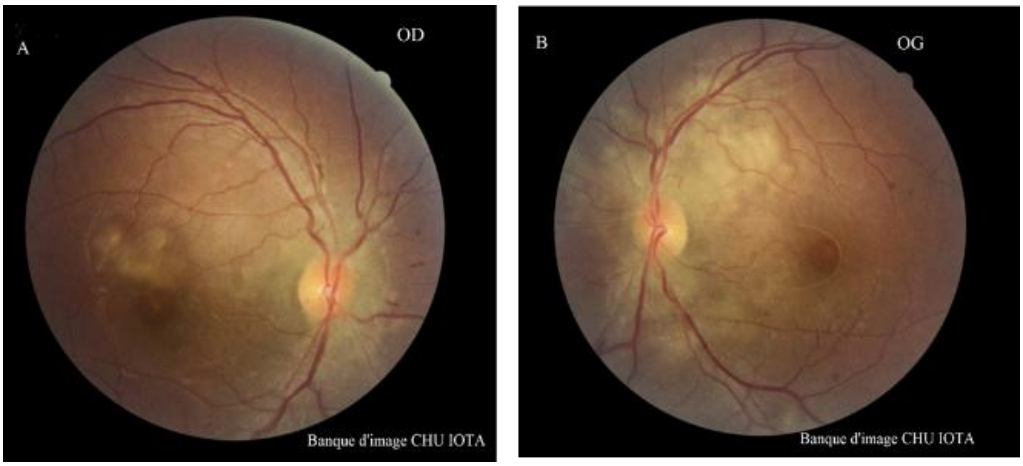

Figure 4: Non-mydriatic fundus photographs (OD and OS) of a 27-year-old patient hospitalized at Gabriel Touré University Hospital for severe preeclampsia with imminent eclampsia signs, showing in both eyes papilledema, flame-shaped and dot retinal hemorrhages, and a serous retinal detachment (SRD)

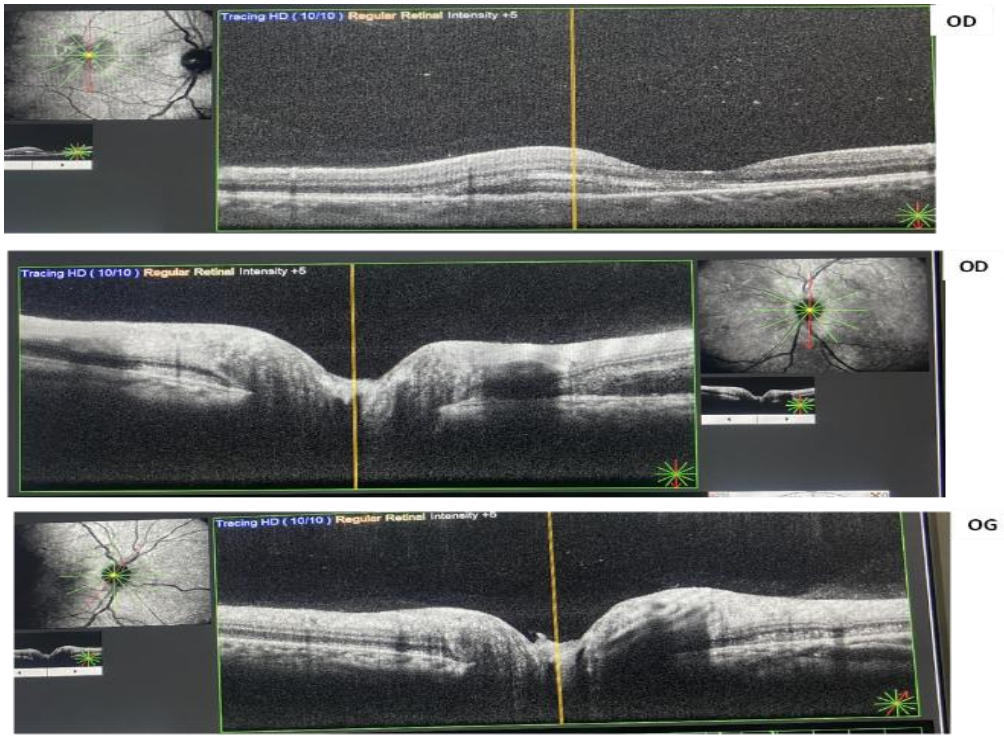

Figure 4: OCT scan of the same patient, demonstrating papillary edema and serous retinal detachments (SRD) in both eyes (OD and OS)

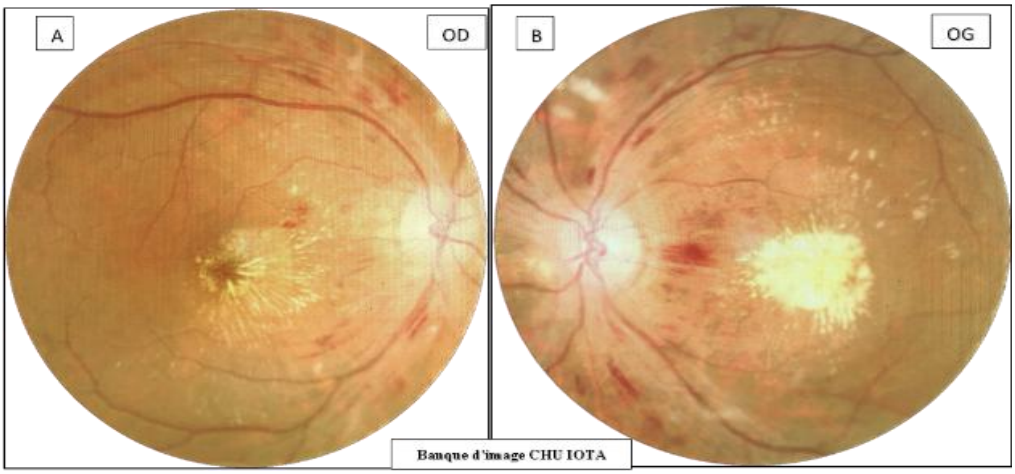

Figure 5: Non-mydriatic fundus photographs (OD and OS) of a 39-year-old patient (BCVA: hand movements OD, light perception plus OS) hospitalized at Gabriel Touré University Hospital for eclampsia, showing in both eyes cotton-wool spots, retinal hemorrhages (flame-shaped and blot), diffuse arterial narrowing, hard exudates with a macular star pattern, and papillary edema: Stage III hypertensive retinopathy according to Kirkendall (OD and OS) complicated by macular edema

Ophthalmologic examination revealed a normal fundus in 177 (51.8%) right eyes and 181 (52.9%) left eyes. Retinal lesions were present in 165 (48.2%) right eyes and 161 (47.1%) left eyes.

Of the 355 expected newborns, 123 died, corresponding to a perinatal mortality rate of 34.6%.

Among the deceased fetuses, 67 (54.5%) OD and 63 (51.2%) OS concerned mothers with hypertensive retinopathy. The risk of stillbirth for preeclamptic/eclamptic patients was 31.6% (OD) and 33.9% (OS) among those with a normal fundus, compared with 40.6% (OD) and 39.1% (OS) among those with hypertensive retinopathy.

DISCUSSION

Our study had several limitations. Some patients were unable to undergo non-mydriatic fundus photography and/or B-scan ultrasonography, despite clinical indication, due to financial constraints. In addition, fluorescein angiography was not available, even in cases of severe or complicated hypertensive retinopathy.

Maternal age < 18 years or > 40 years is recognized in the literature as a risk factor for preeclampsia/eclampsia [10]. In our cohort, the mean maternal age was 25.62 ± 7.06 years (range: 15–45 years). These findings are comparable to those reported by Diallo et al. [2] in Burkina Faso, Ngwanou et al. [11] in Cameroon, and Sankare et al. [12] in Mopti, who reported mean ages of 26.37, 24.8, and 24.14 years, respectively. The 20–24-year age group was the most represented in our series. Conversely, Sankare [12] in Mopti and Goita [13] in Nioro reported younger dominant age groups (16–20 years and 16–19 years, respectively). These discrepancies may be attributable to socio-cultural differences and to the fact that these age groups correspond to the peak reproductive years in their respective populations.

In our study, 34.8% of participants had no formal education, a proportion similar to that reported by Sogoba [14] (34.7%). Goita et al. [13] reported a markedly higher rate of women without formal education (87%). Education has a well-established role in improving health literacy and promoting active engagement in maternal health. The lower proportion observed in our study may be related to the urban setting of our study site. Conversely, Goita et al. conducted their study in rural Nioro, where financial barriers frequently result in preferential schooling of boys, who are traditionally viewed as the future heads of households [13]. According to UNICEF (2001), in contexts of severe poverty, early marriage of girls is often used as a family survival strategy in many regions of sub-Saharan Africa.

The majority of our participants (70.8%) were housewives. This aligns with the findings of Djigande et al. [15] and Diabaté et al. [16], who reported 67% and 50% housewives, respectively. The high prevalence of severe preeclampsia/eclampsia in this group may result from increased physical workload, consistent with Saurel-Cubizolles et al.[17], who demonstrated that women's occupational conditions—noise exposure, intense physical activity, and psychological stress—are associated with the development of gestational hypertension. These working conditions reflect the daily reality of women in our socio-economic context.

Primigravidas (36.5%) and nulliparous women (40.4%) predominated in our study population. These results are consistent with the literature [18]. Keita et al. [19] reported 67% primigravidas, and Samake et al. [3] reported 43.07% nulliparity.

We observed that 20.2% of pregnancies were not followed. Sankare et al.[12] in Mopti and Goita et al. [13] in Nioro reported much higher proportions of unsupervised pregnancies

(66.7% and 70%, respectively). These differences may be related to disparities in maternal education, socio-economic conditions, and geographical accessibility—factors known to influence antenatal care attendance.

Proteinuria has a strong prognostic value for maternal–fetal outcomes when significant; high-grade proteinuria increases fetal risk by more than 20-fold [20]. In our series, 62.3% of patients had proteinuria ≥ 3+. These findings exceed those of Diabaté et al. [16]and Sankare et al. [12], who reported rates of 35.72% and 40.2%, respectively. This may be explained by the greater severity of cases managed at CHU Gabriel Touré, which functions as a tertiary referral center.

In our series, 68.7% of patients presented with WHO Grade III hypertension, with systolic blood pressure ≥ 180 mmHg and/or diastolic blood pressure ≥ 110 mmHg. This aligns with literature reporting severe disease at these thresholds [12,21,22]. Severe preeclampsia was the most frequent diagnosis (67.3%), while eclampsia accounted for 32.7%. Diallo et al. [2] in Bobo Dioulasso and Ngwanou et al. [11] in Yaoundé reported similar patterns, with severe preeclampsia representing 69.3% and 62.8% of cases. In contrast, Sankare et al. [12] reported eclampsia as the predominant diagnosis (59.8%), likely reflecting insufficient antenatal care and limited resources for early management in rural settings.

Blurred vision was the most frequently reported ocular symptom (22.8%). Ngwanou et al. [11] and Rajaona et al. [23] found higher rates (41.9% and 36.2%, respectively), likely attributable to the greater severity of retinal involvement in their populations, where hypertensive retinopathy Stage III reached 32% and 75%, compared with 6.1% OD and 4.7% OS in our study.

Distance visual acuity was ≥ 3/10 in 91.2% (OD) and 92.4% (OS). We identified 24 cases of visual impairment in the right eye and 23 in the left eye (BCVA < 3/10), as well as 6 cases of transient blindness in the right eye and 3 in the left eye (post-ictal BCVA < 1/20). Diallo et al. [2] reported 2 cases of transient post-ictal blindness; Ngwanou et al. [11] reported 8 cases of visual impairment; Sankare et al. [12] identified 3 cases with post-ictal BCVA < 1/20. The higher rates in our series may be explained by the shorter delay between hospitalization and ophthalmic assessment (2–4 days) compared with 15 days in the study by Sankare et al. Hypertensive retinopathy was present in 48.2% (OD) and 47.1% (OS) of our patients, values similar to those reported by Ngwanou et al. [11] and Sankare et al. [12] (48.8% and 47%, respectively). Rajaona et al. [23] reported a higher prevalence (65.4%), likely due to a smaller sample size (N = 33 vs. N = 342 in our study).

Hypertensive retinopathy was more frequent in eclamptic patients (55.4%) than in preeclamptic patients (45.7%), consistent with the literature [45,70,71]. However, Sankare et al. [12] reported the opposite trend. This may be due to the high proportion of eclamptic cases referred to CHU Gabriel Touré, the tertiary care center.

Hypertensive retinopathy Stage I was the most common grade in our cohort (22.5% OD; 21.6% OS). Diabaté et al. [16] and Sankare et al. [12] also reported Stage I predominance, albeit with higher proportions (67.85% and 67.4%). Our larger sample size may account for these differences. Stage II retinopathy was more frequent among eclamptic patients, whereas Stage I predominated in preeclampsia, possibly reflecting the higher severity and presence of convulsive episodes, which are known to exacerbate retinal injury.

The main retinal complications observed in our series were: macular edema (2.9% OD; 1.5% OS), serous retinal detachment (SRD) (0.6% OU), hypertensive choroidopathy (0.6% OU), and branch retinal vein occlusion (BRVO) (0.3% OD). Diallo et al. [2] reported similar complications but at higher frequencies (2.4% hypertensive choroidopathy, 3.9% SRD, 0.8% macular edema). Rajaona et al. [23] reported notably higher rates of SRD (66.7%), likely due to sample size and disease severity. We found a statistically significant association between hypertensive retinopathy and hypertension grade in both eyes ($p = 0.011$ OD; $p = 0.001$ OS), consistent with the findings of Sankare et al. [12] and Rajaona et al. [23], who similarly reported associations with severe forms of preeclampsia.

Ophthalmic examination revealed a normal fundus in 175 patients, while 167 exhibited hypertensive retinopathy in one or both eyes. Of the 342 pregnancies, 120 were complicated by intrauterine fetal demise (IUFD) (35.1%). Among these, 64 cases (54.2%) occurred in women with hypertensive retinopathy. The risk of stillbirth among preeclamptic/eclamptic patients was 31.42% (53/175) in those with a normal fundus versus 38.9% (65/167) in those with hypertensive retinopathy..

CONCLUSION

Severe preeclampsia and eclampsia represent major public health challenges. They affect nearly half of the women admitted for delivery at Gabriel Touré University Hospital. In our study, maternal age was not associated with the occurrence of hypertensive retinopathy; however, retinopathy was more frequently observed in eclamptic patients, and the more advanced stages of hypertensive retinopathy were predominantly found in severe forms of preeclampsia. We identified a statistically significant association between the presence of hypertensive retinopathy and the severity of arterial hypertension. The risk of stillbirth was 1.2 times higher among patients exhibiting retinal lesions compared to those without retinal involvement. These findings support the consideration of hypertensive retinopathy as a marker of disease severity in preeclampsia. Early identification of these retinal lesions could allow timely and more effective management aimed at improving both maternal and fetal outcomes. Therefore, ophthalmologic assessment—including a dilated fundus examination—is justified in this population to screen for these ocular manifestations.

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