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Evaluation of Various Clinico-Pathological Eye Changes during Pregnancy

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Abstract
Purpose:- *To evaluate various clinico-pathological changes occuring in the eye during pregnancy.*
Material and Methods :- *A prospective observational study was conducted. All investigations related to ocular problems were explained and done.*
Results :- *Of 241 patients presented with any eye problems during pregnancy, Chloasma was seen in 58 patients(24.1%) among which maximum resolved postpartum. Lid abnormalities were present in 10 patients (4.2%) among which 1 patient of naevus of Ota and 2 patient of mole remained stationary while other conditions improved. Conjunctival pathologies were seen in 16 (6.6%) out of which conjunctival naevus didn't show any changes while rest conditions resolved. In visual status 99.17% patients achieved 6/6 vision at end of follow up while two patients remained at PL+PR+which were total choroidoretinal detachment and optic atrophy. The mean intraocular pressure was 12.22 mm Hg. Pathological fundus findings were seen in 72 cases among which Grade I HTN retinopathy was most common finding followed by Grade II HTN retinopathy. 4 patients had Grade IV HTN retinopathy (1 with exudative RD), 3 had diabetic retinopathy, 2 had subhyaloid haemorrhage,1 patient had bilateral exudative bullous RD, 1 had CSR, 1 with total choroido-retinal detachment, one patient had optic atrophy.*
Conclusion:- *Pregnantfemales were at high risk of developing certain pathological ocularchanges but since most of the changes resolve postpartum, discriminating pathological eye diseases from physiological ocular changes is important in order to establish an individualized treatment as conservative management is the mainstay of treatment.*
Key words: *Eye changes in pregnancy, HTN retinopathy, Exudative RD, diabetic retinopathy, optic atrophy.*

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I. Introduction

The virtue of becoming a mother is God's greatest gift to womankind. Pregnancy is a physiological situation which places abnormal stress and demands on a pregnant woman's body.[1] The physiological, haematological, hormonal, immunological and metabolic changes in the body of a pregnant woman merit special consideration, as also the eye. The maternal endocrine and the placenta (the hormone factory) cause ocular morbidities which are reversible, transient and rarely permanent.[2]

The ocular effects of pregnancy may be physiological, pathological or may be modification of pre-existing conditions.[3] Physiological changes include increased pigmentation of lids, ptosis, changes in cornea and refractive status and decreased intraocular pressure which usually resolve postpartum.[4] Pre-existing conditions such as Grave's disease, Retinitis Pigmentosa and Optic neuritis should be monitored due to their relapses in pregnancy.

Changes in lacrimal function during pregnancy is usually negative. Not surprisingly, higher prevalence of dry eye had been reported in both in human and experimental studies during pregnancy. Some sequalae of dry eye disease (a known disorder in pregnancy) such as keratopathy could be vision threatening.[5]

Corneal thickness has been found to increase during pregnancy, resolving postpartum.[6] A possible cause may be fluid retention related to pregnancy. The corneal curvature is also found to increase by an average of 1.00 dioptre (D) in second half of pregnancy resolving postpartum or after cessation of breastfeeding.[7] There is a decrease in corneal sensitivity during pregnancy. Hormonal changes during pregnancy may affect corneal

biomechanics because pregnancy has been described as a potential risk for the progression of keratoconus.[8]Thesechanges might have clinical implications such as need to change spectacles, intolerance to contact lenses, and decisions regarding performing refractive eye surgery. Kruckenburg spindles have been observed with a higher frequency. A mild spasm of conjunctival arterioles may be noted in third trimester with decrease in the number of capillaries visualised as the pregnancy proceeds.[9] Subconjunctival haemorrhage may also occur.

During pregnancy, changes in anterior chamber parameters are expected due to both fluid retention in the body and increased aqueous humour outflow.[10] In the anterior chamber parameters, there is increase in anterior chamber volume, anterior chamber depth and anterior chamber angle. In diagnosis and follow up of anterior segment pathologies, patient should be questioned about being pregnant or not and the fact that pregnancy can cause changes in anterior chamber parameters must be kept in mind.

Nearly all pregnant women have reactive changes of the retinal vessels, but clearly visible changes only in the setting of hypertension, pre-eclampsia and eclampsia. Ocular involvement occurs in a majority of patients of PIH.[11]There occurs spasm and narrowing of retinal arterioles in PIH, which if uncontrolled, is characterized by cotton wool spots, microaneurysms, flame shaped and splinter haemorrhages, hard exudates, disc edema (hypertensive optic neuropathy) etc.[11-14]Progression of retinal changes correlates with progression of PIH and also with the fetal mortality due to similar vascular ischemic changes in the placenta.

Retinal detachment is one of the most dramatic and potentially serious ocular complication of PIH[15] due to choroidal dysfunction, primarily choriocapillaries ischemia. Serous exudative detachments have been reported to occur in 10% of patients with eclampsia and in 1- 2% of patients with severe preeclampsia. Soon after delivery spontaneous retinal reattachment occurs within weeks. The development of retinal pigment epithelial tear has been reported after PIH and abruptio placentae.[16] Cases of optic atrophy following detachment has also been reported. Spontaneous vitreous haemorrhage and bilateral retinal neovascularization regressing after delivery have been reported in PIH with clotting abnormalities.[17]There may be circumscribed neurosensory retinal detachment at the posterior pole-Central Serous Chorioretinopathy (CSR) associated with pregnancy.[18]Serous exudative detachments are usually bilateral and bullous, although cases with cyst-like detachments have also been reported. The presence of a retinal detachment has not been reported to have an adverse effect on fetal prognosis. The detachment is thought to be due to choroidal vascular changes. Most patients with retinal detachments have full resolution of the detachment with return to normal visual function within a few weeks postpartum.

Pregnancy and the subsequent puerperium represent hypercoagulable states with an increase in thrombin levels and pro-coagulant factors and a decrease in the levels of the endogenous anticoagulant protein S.Progesterone acts on blood vessels thus causing venous stasis so pregnancy is a hypercoaguble state therefore there is increased risk of vision threatening conditions such as retinal vein occlusions (RVO).[19-20]

Transient cortical blindness has also been reported in eclampsia and occasionally in severe preeclampsia, in late pregnancy or shortly postpartum. Cerebral edema of the occipital lobes has been documented by CAT scan, with return to normal within a few weeks.

When Pseudo tumour cerebri occurs in pregnancy, PTC usually appears in the first 20 weeks of gestation, although it may be seen in any trimester. Pregnant patients with the PTC appear to have the same rates of spontaneous abortion as the general population, and visual outcome for pregnant women with PTC is no different from that seen in non- pregnant women with this disorder.

A gestational diabetic (a previously non-diabetic woman, who becomes diabetic only during pregnancy) is not at risk for development of retinopathy women with this disorder. Patients with background diabetic retinopathy (BDR) at the start of pregnancy often follow a waxing and waning course during pregnancy. The retinopathy often worsens in the second trimester with clearing in the late third trimester and postpartum. Patients with background retinopathy should probably be examined by an ophthalmologist at least once per trimester.

A woman with Retinitis Pigmentosa (RP) may have visual field deterioration during pregnancy. Grave's disease may be aggravated, or may present in early pregnancy. There may be some amelioration in the latter half of pregnancy, with recurrence in the postpartum period.

Incidence of ocular melanoma and reactivation of quiescent melanomas has been noted to be higher in pregnant women when compared to age matched non-pregnant women[21]. More recent studies have found no evidence of any hormonal dependence on uveal melanomas, unlike cutaneous melanomas.[22]

Posterior scleritis is known to get aggravated during pregnancy.[23] Recurrences are more common in pregnancy.[24]VKH is characterized by bilateral granulomatous pan-uveitis, exudative retinal detachments, meningeal signs, hearing loss, and pigment loss. It tends to regress or totally disappear during pregnancy and post-partum.[25]

Immunological diseases-There is an improvement in both ocular and systemic manifestations of the sarcoidosis, spondyloarthropathy, rheumatoid arthritis during pregnancy probably due to the increased amount of endogenous corticosteroids during pregnancy. Post-partum recurrence or flare-ups are noticeable.

Latent ocular toxoplasmosis-This may reactivate during pregnancy in the mother.[26] The risk to the fetus of congenital toxoplasmosis in these cases is negligible.

II. Material and Methods

Study Design

A prospectiveobservational study was conducted at the Vitreo Retinal Services in Upgraded Department of Ophthalmology of J.L.N. Medical College, Ajmer (Rajasthan), India.

Study Period - 1 Dec 2017 to 30 June 2019. Ethical clearance was taken from our institutional review board.

Inclusion criteriaAll Pregnant women complaining of eye or related problems in the $1^{st}2^{nd},3^{rd}$ trimester of pregnancy.Pregnant women with any gestational Diabetes Mellitus or any pre-existing problems like Diabetes, Hypertension and pregnant women with pre-existing ocular comorbidity included.

Exclusion Criteria- Severely ill, bedridden, immunocompromised pregnant ladies in whom complete ocular examination can't be possible.

Instruments and Methods of Data Collection

Informed and written consent were taken from all patients. All the subjects underwent a detailed ocular and systemic examination. Preliminary eye examination included visual acuity, Slit lamp biomicroscopy of anterior segment to rule out any corneal pathology and refraction. Intraocular pressure was recorded using Goldmann applanation tonometry (GAT)/Schiotz tonometer wherever possible. Fundus examination was done using Direct ophthalmoscope, Indirect ophthalmoscope and Slit lamp biomicroscopic examination with +90 D lens. Gonioscopy was done to rule out closed angle glaucoma wherever possible. Visual field examination by Humphery field analyser for visual field defects, Fluorescein Angiography using a fundus camera (Kowa 10 Xa, Japan) and OCT (Optical Coherence Tomography performed through a dilated pupil by 3D OCT – 1 mestro, Topcon) were done whenever needed. On every follow up, vision and IOP were taken and fundus examination done, OCT and fluorescein angiography done (when required).

Data Analysis

The obtained data were entered and analysed with SPSS software version 17. Variables were summarized using frequency, percent, mean and standard deviation. Data were presented in tables and graphs. Since the study was an observational study design, statistical significance was not assessed.

Some figures relevant to this study are :

Fig. 1 : Chloasma

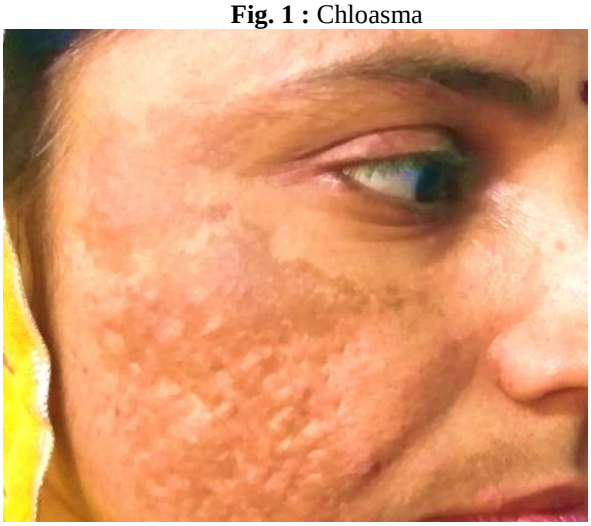


Fig. 2 : Naevus of Ota

Fig 3 : Episcleritis

Fig. 4 : Grade IV HTN Retinopathy

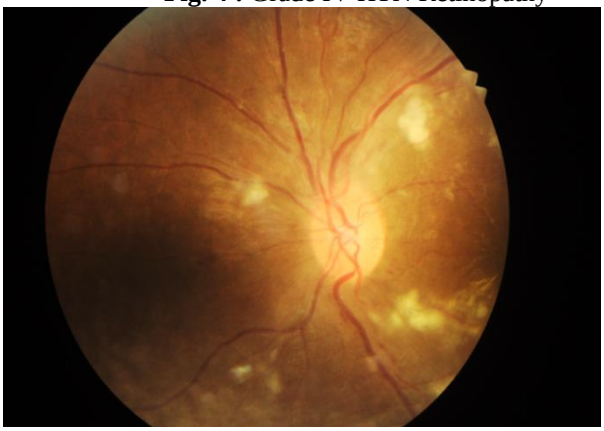


Fig. 5 : PDR with multiple NVE

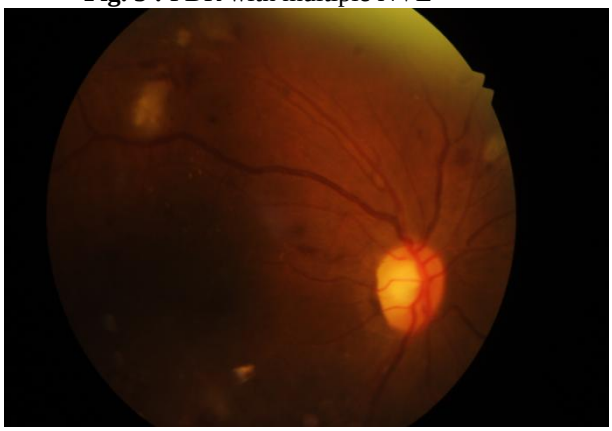


Fig. 6 : Diabetic Macular Edema

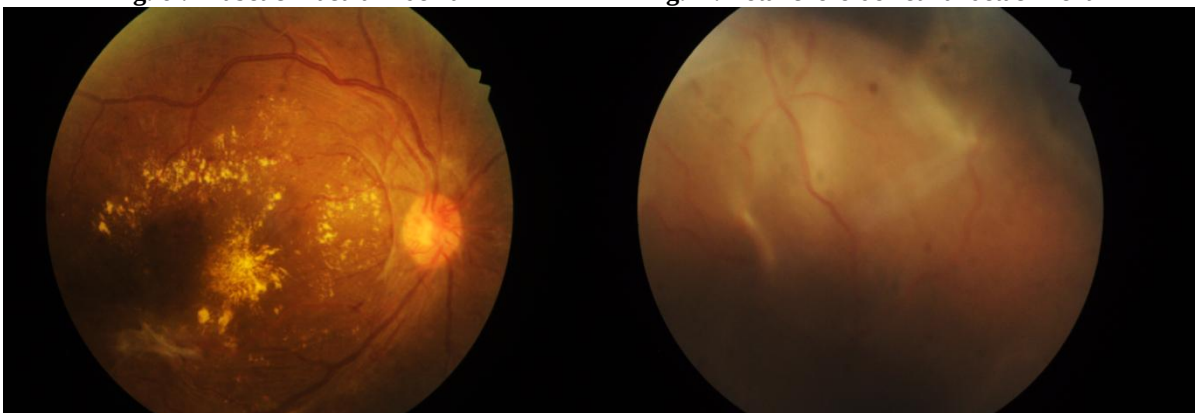


Fig. 7 : Total choroido-retinal detachment

III. Observation and Results

A total of 241 patients were recruited in the study. Among these patients there were 51 patients of pre-eclampsia, 28 patients of eclampsia, 8 patients with pre-existing hypertension and 3 patients with pre-existing diabetes mellitus. The results of our study are :

Table 1 : Frequency and percent of chloasma.

Chloasma	**Frequency**	**Percent**
Absent	183	75.9
Present	58	24.1
Total	241	100.0

Table 2 : Various lid pathologies.

Lids	Frequency	Percent
Normal	231	95.8
Lid swelling	4	1.7
Ptosis	3	1.2
Naevus of Ota	1	0.4
Lid moles	2	0.8
Total	241	100.0

Table 3 : Conjunctival findings.

Conjunctiva	Frequency	Percent
Normal	225	93.4
Conjunctivitis	3	1.2
Episcleritis	4	1.7
Naevus	4	1.7
Subconjunctival hemorrhage	5	2.1
Total	241	100.0

Table 4 : Visual status.

Vision (Snellen's acquity)	Frequency	Percent
6/6	216	89.6
6/9	6	2.5
6/12	5	2.1
6/18	1	0.4
6/24	2	0.8
6/36	1	0.4
6/60	4	1.7
FC = 5M	1	0.4
FC = 3M	1	0.4
FC = 2M	1	0.4
FC = 1M	1	0.4
FCCF	1	0.4
PL+PR+	1	0.4
Total	241	100.0

Table 5 : Intraocular Pressure.

Variable	IOP (mm Hg)
Minimum	3.60
Maximum	20.60
Mean	12.22
Standard deviation	3.29

Table 6 : Fundus findings noted.

Fundus	Frequency	Percent
Normal	169	70.1
Grade I HTN	50	20.7
Grade II HTN	8	3.3
Grade III HTN	1	0.4
Grade IV HTN retinopathy	3	1.2
Grade IV HTN retinopathy + exudative RD	1	0.4
Exudative Bullous RD	1	0.4
CSR	1	0.4
Diabetic macular oedema	1	0.4

PDR with Multiple NVE	2	0.8
Sub-hyaloid haemorrhage	2	0.8
Total choroido-retinal detachment	1	0.4
Optic atrophy LE	1	0.4
Total	241	100.0

Table 7 : Fundus findings in Pre-eclampsia.

Fundus	**Pre-eclampsia**	**Percent**
Normal	8	15.5
Grade I HTN	40	78.4
Grade II HTN	2	3.9
Subhyaloid haemorrhage	1	1.96
Total	51	100

Table 8 : Fundus findings in Eclampsia

Fundus	**Eclampsia**	**Percent**
Normal	7	25
Grade I HTN	8	28.5
Grade II HTN	6	21.4
Grade III HTN	1	3.5
Grade IV HTN retinopathy	3	10.7
Grade IV HTN Retinopathy+ exudative RD	1	3.5
Exudative bullous RD	1	3.5
Optic atrophy LE	1	3.5
Total	28	100

Table 9 : Fundus changes in Pre-existing DM.

Fundus	**Pre-existing DM**
DME	1
PDR with multiple NVE	2
Total	3

Graph 1 : Graphical representation of Comparison of chloasma at presentation & last follow up.

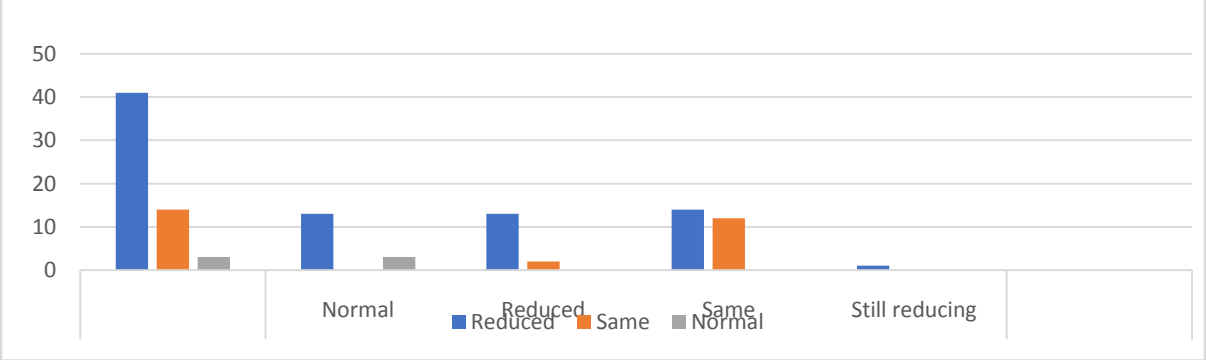


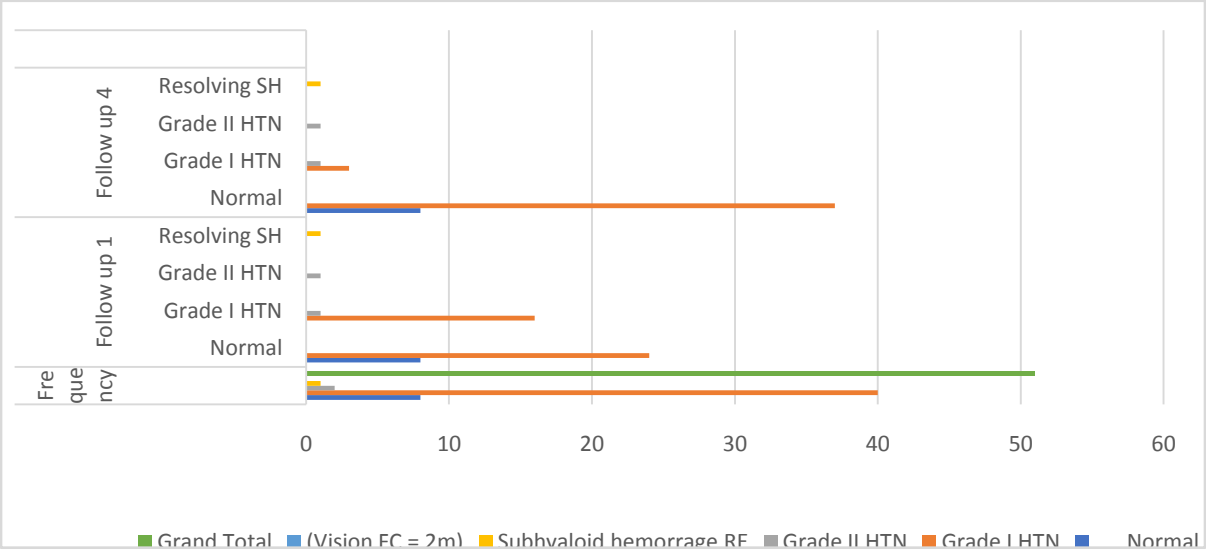
Table 10 : Comparison of lid pathologies at presentation and follow up.

Pathology	**Frequency**	**Follow up 1**	**Follow up 4**
Lid swelling	4	Swelling reduced	Normal
Naevus of Ota	1	Stationary	Stationary
Lid moles	2	Stationary	Stationary
Ptosis	3	Improved	Normal
		Normal	Normal
		Same	Normal
Total	10		

Table 11 : Comparison of conjunctival pathology at presentation and follow up.

Pathology	Frequency	Follow up 1	Follow up 4
Conjunctivitis	3	Treated	Normal
Episcleritis	4	Improved	Normal
Naevus	4	Stationary	Stationary
Subconjhmg.	5	Resolved	Normal
Total	16		

Graph 2 : Graphical representation of comparison of fundus findings at presentation & last follow up in pre-eclampsia



Graph 3 : Graphical representation of comparison of fundus findings at presentation & last follow up in eclampsia.

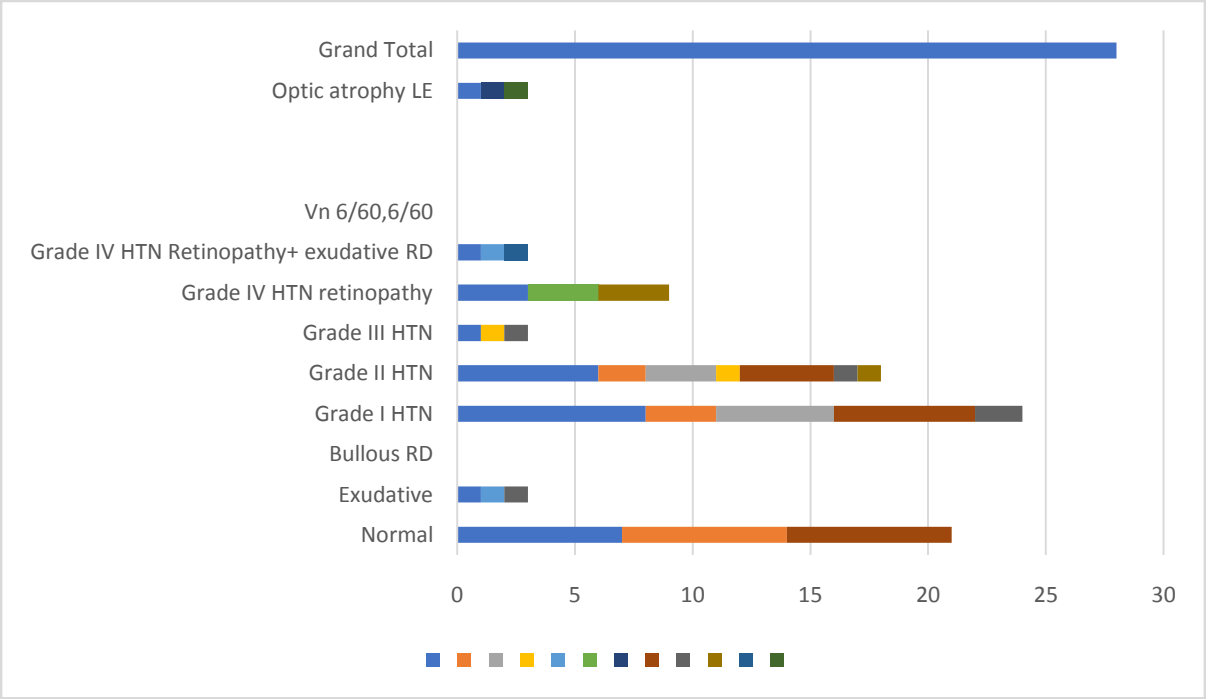


Table 12: Comparison of fundus findings at presentation & last follow up in patients with pre-existing DM.

Fundus	**Frequency**	**Vision at presentation**	**Follow up 1 & 4**		**Follow up**	
					1	4
			NVE Reduced	Resolving edema	Vision	Vision
DME	1	FC=5M, 6/24p	-	1	6/60, 6/24	6/12
	1	6/60,FC=3M	1	-	6/60, FC =5M	6/18p
PDR withMultiple NVE	1	FC = 3M	1	-	FC=4.5M, 5M	FC=6M
Total	3					

IV. Discussion

Our study on evaluation of various clinicopathological eye changes during pregnancy included 241 patients (482 eyes). The age group of patients ranged from 17-39 years with a mean of 25.46 years. Out of 241patients 63 (26.14%) were in their first trimester, 63 (26.14) in second trimester while rest of the patients 115 (47.72%) were in third trimester.

Out of 241 patients, 79 patients had PIH (32.8%). The SBP ranged between 110-220 mmHg with a mean of 138.2 mmHg while DBP ranged between 70-110 mm Hg with a mean of 84.21 mmHg. The blood sugar of the patients varied between 60-325 mg% with a mean of 82.37 mg%.

Chloasma also known as the mask of pregnancy was present in 58 (24.06%) patients out of which 16 patients (27.5%) returned to normal postpartum while rest of the patients were still having some pigmentation at end of follow-up.

We also studied lid and conjunctival pathologies in pregnant females. Conjunctivitis and episcleritis were treated while other conditions like ptosis, lid swellings and subconjunctival haemorrhage resolved by themselves. Few conditions like lid moles, conjunctival naevus and naevus of Ota remained stationary and didn't show any progression.

Goldich Y, Cooper M et al 2014 documented that IOP was significantly lower in the pregnant group. Our study also demonstrated that IOP was slightly lower in the pregnant females (mean IOP was 12.22 mm Hg).

A R Rasdi et al 2011 conducted a study on 154 pregnant females and found that 32.5% patients had hypertensive retinopathy with 98% patients having 6/6 vision antepartem that reached to 100% post partem. Our study demonstrated 79 patients of PIH (32.78%), and 8 patients with pre-existing HTN. 26.97% had hypertensive retinopathy among which Grade I HTN was most common(63.29%). Next most common finding was Grade II HTN (10.12%). 3.7% patients had Grade IV HTN retinopathy while only 1 patient had Grade IV HTN retinopathy with exudative RD. 95.02% patients had 6/6 vision antepartum (including those with spectacle corrected 6/6 vision) which reached to 99.17% at end of follow-up. One patient with sub-hyaloid haemorrhage was left with 6/9 vision while one patient with optic atrophy and other with total choroido-retinal detachment remained at PL+PR+.

Rankoaoyagitakaaki, Hayashi et al in 2015 reported a case of a 39 year-old woman, who was diagnosed with PIH, reported blurred and distorted vision at 5 days after an emergency caesarean delivery. OCT revealed a large serous retinal detachment (SRD). In our study also, a 21 year old woman, diagnosed with severe eclampsia, reported blurred and diminished vision at day 1 after an emergent caesarean delivery. Her vision was FC=1M in both eyes and fundoscopy examination revealed exudative bullous RD in both eyes as also evidenced by OCT. The patient was managed conservatively, at first follow-up there was resolution of RD on fundus and OCT vision being 6/36 in both eyes. At the end of follow-up there was complete resolution of exudative RD and vision returned to 6/6 in both eyes. A case of CSR was also found that returned to normal postpartum.

FriederikeMackensen et al 2014 demonstrated that in diabetic women pre-existing retinal changes worsen during pregnancy in 55% of cases. In our study there were total 3 patients of diabetes in which 1 patient was a case of gestational diabetes while rest two patients were of type 2 DM. All the three patients had diabetic retinopathy which worsened during their current pregnancy. One patient had diabetic macular edema (vision-FC=5M,6/24) while rest 2 patients had PDR with multiple NVE. The patients were managed with laser

photocoagulation. On continued follow-up the patients significantly improved and the NVE in the two patients also reduced.

Sang Jun Park, Nam-Kyong Choi et al[19-20]in 2015 conducted a study in which Pregnancy-related RVO was identified in 33 cases from the 1.8 million women who experienced childbirth during the study period, in our study not even a single case of retinal vascular occlusion was found.

V. Conclusion

We concluded that pregnant females were at high risk of developing certain pathological ocular changes but since most of the changes resolve postpartum, discriminating pathological eye diseases from physiological ocular changes is important in order to establish an individualized treatment or preventive plan and also that appropriate policy should be put in place to encourage routing ocular examination during pregnancy.

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