

Study of ocular fundus changes in pregnancy induced hypertension

Stuti V Juneja¹, Afsa F Rathod²

ABSTRACT

Background

Pregnancy, being a challenge to the human body, is associated with a group of physiologic and pathologic changes. A fatal trio of haemorrhage, heart disease, and stroke is formed by hypertensive disorders, which affect 5–10% of all pregnancies and significantly increase maternal and foetal morbidity and mortality. The purpose of this study is to characterise retinal changes in pregnancy-induced hypertension and investigate the relationship between retinal changes and the severity of the hypertension.

Methods

A total of 150 pregnant women admitted with pregnancy-induced hypertension (PIH) were included. Patients with pre-existing hypertension, diabetes mellitus, renal diseases and hazy media restricting the visualization of fundus were excluded from the study. The vision, anterior segment, and Fundus were examined.

Results

Overall mean age of the study was 26.64 ± 4.64 years. In our study, the prevalence rate of fundus changes was 73.3% with occurrence of retinal vascular changes in eclampsia patients more than mild pre-eclampsia. Also, we observed a significant association between proteinuria and fundus changes. ($p \leq 0.0001$)

Conclusions

We observed that severity of pregnancy induced hypertension had a significant relationship with hypertensive retinopathy.

Keywords: Hypertensive retinopathy, macular oedema, proteinuria, retinal detachment.

GJMEDPH 2024; Vol. 13, issue 2 | OPEN ACCESS

2*Corresponding author: .Afsa F Rathod, MS Ophthalmology, Senior Resident, Department of Ophthalmology, Baroda Medical College, Gujarat, India, Email: rathodaf97@gmail.com; 1. Stuti V Juneja, MS Ophthalmology, Associate Professor, Department of Ophthalmology, Baroda Medical College, Gujarat, India, Email: junejast@gmail.com

Conflict of Interest—none | Funding—none

© 2024 The Authors | Open Access article under CC BY-NC-ND 4.0



INTRODUCTION

Hypertensive disorders form the most common complication in all antenatal admissions affecting between 7–15% of all gestations, thus forming quarter of all such antenatal admissions.¹ According to systematic review on maternal mortality worldwide done by World Health Organization's (WHO), hypertensive disease remains the leading cause of direct maternal mortality. Hypertension along with infection and haemorrhage, constitutes the deadly triad during pregnancy and childbirth, contribute to the major morbidity and mortality during that period.² Maternal mortality in developed countries was found to be much lower than in developing countries, but still about 16% of such deaths were due to hypertensive disorders and over half of these deaths were preventable.³ In India, 18.35% and 0.96% of maternal morbidity and maternal mortality respectively were due to hypertensive disorders of pregnancy (HDOP).⁴ In a study, Hindward M. et al observed that pooled prevalence of HDOP in India was 9% (95% CI, 8%–10%), which was found significantly higher than the global prevalence.⁵ Hypertensive disorders also carry a risk for the baby. Hypertension and/or proteinuria is the leading single identifiable risk factor in pregnancy associated with stillbirth. Preeclampsia is strongly associated with foetal growth restriction, low birthweight, spontaneous or iatrogenic preterm delivery, respiratory distress syndrome and admission to neonatal intensive care.⁶ "Hypertensive disorders in pregnancy" is most accepted terminology for the following defined syndrome nowadays, as given by the American College of Obstetrics and Gynecology.^{2,7} Based on American College of Obstetrics and Gynaecology, pregnancy induced hypertension was graded as gestational hypertension, preeclampsia and eclampsia. Preeclampsia is defined as new onset hypertension and proteinuria after 20 weeks of gestation. Eclampsia is defined as the development of generalised tonic-clonic seizures not due to another cause in a woman with pre-eclampsia. Vascular changes in vivo can be directly observed in

the retinal vessels only and so in early years fundus examination was the main criteria for evaluating the degree of Pregnancy Induced Hypertension.⁷⁻¹⁰ The ocular involvement is also common during pregnancy induced hypertension. Most of the common symptoms like blurring of vision, photopsia, scotomas, and diplopia may be noted. Visual system involvement is due to severe toxemia. The most common abnormality seen is spasm and narrowing of the retinal vessels. Vision threatening conditions involved are central retinal artery occlusion, secondary optic atrophy, central serous retinopathy, retinal detachment, central retinal vein occlusion, choroidal ischaemia and haemorrhage. Spontaneous vitreous haemorrhage may occur in cases of HELLP syndrome (patients with haemolysis, elevated liver enzymes, and low platelet count). Hence, this study was undertaken with an aim to evaluate the fundus changes in pregnancy induced hypertension.

Methodology

This is a prospective observational study carried in a tertiary care hospital of central Gujarat and included 150 patients who had pregnancy induced hypertension (>28 weeks) These patients were enrolled between the period of November 2021 to August 2022.

Inclusion Criteria

All present patients > 28 weeks of pregnancy with pregnancy induced hypertension who gave written and informed consent for our study.

Exclusion Criteria

- Unwilling for consent by patients /relatives.
- Patients with pre-existing conditions like diabetes, hypertension and renal disease.
- Patients with hazy media restricting the visualisation of fundus.

After obtaining approval from the Institutional Ethical Committee for Biomedical and Health Research (No. IECBHR/092-2022) and taking written informed consent from individual patients in their own language, all patients fulfilling the inclusion and exclusion criteria were enrolled and studied for ocular fundus changes at the time of admission and for follow-up done at 1 week of termination of pregnancy. Cases were divided into mild and severe preeclampsia and eclampsia according to the severity.^[11] This study consisted of 150 pregnant women. Cases were taken from the labour-intensive care unit, ophthalmology OPD and from the hospital's labour room. A detailed history and ocular examination were done. 1% tropicamide (mydriatic drug) was used for dilation of pupils. After dilation of pupils, examination of the fundus was done by direct as well as indirect ophthalmoscope. Data was collected, compiled and tabulated in excel sheet. Qualitative data was represented as numbers with percentage. Quantitative data was represented as mean with standard deviation. Statistical analysis was done by SPSS 26.0 version software (IBM, SPSS,

Inc.). A 'p' value of <0.05 value was considered as statistically significant.

Results

All the registered 150 patients had pregnancy-induced hypertension. The average age in our study was 26.64 ± 4.64 years. In our study, age groups were divided into six categories: 18-20 years, 21-25 years, 26-30 years, 31-35 years, 36-40 years, and >40 years; maximum patients were of the age group 21-25 years followed by the 26-30 years age group. Least number of patients were found in the >40 years group. There were 71.33% primi gravidae and 28.67% multigravidae among the total 150 patients. In our study, the average systolic and diastolic blood pressure were 170 ± 15.23 and 104 ± 7.51 respectively. We observed that 20 (13.33%) of patients had mild preeclampsia; 71 (47.33%) had severe preeclampsia; 59 (39.33%) had eclampsia. Proteinuria was observed in the following percentage: +1: 58%, 2+: 21.33% and 3+: 20.67%. 73.33% had abnormal fundus findings in that 77.57% primi gravida and 62.79% were multi gravida, and 26.67% had normal fundus findings. Table - I

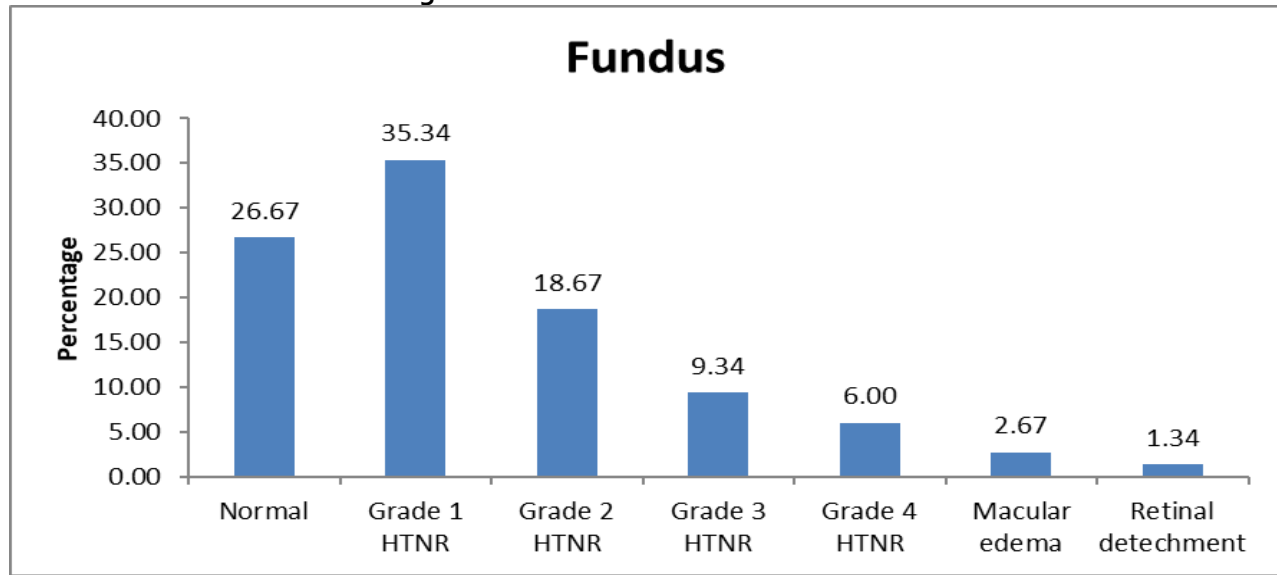
TABLE I: Fundus Findings Based on Gravidae

| | Normal | Abnormal | p-value |
|----------------|-------------|-------------|---------|
| Primi gravidae | 24 (22.43%) | 83 (77.57%) | 0.0651 |
| Multi gravidae | 16 (37.21%) | 27 (62.79%) | |
| Total | 40 | 110 | 150 |

We observed the following fundus findings in our study: 1) Normal: 26.67%; 2) Grade 1 HTNR: 35.34%; 3) Grade 2 HTNR: 18.67%; 4)

Grade 3 HTNR: 9.34%; 5) Grade 4 HTNR: 6%; 6) Macula oedema: 2.67%; and 7) Retinal detachment: 1.34%. (Figure- I)

FIGURE I: Fundus findings In Our Cases



Among retinopathy patients, maximum patients had Grade I HTNR (35.34%), followed by Grade 2 HTNR (18.67%), Grade 3 HTNR (9.34%) and Grade 4 HTNR (6%) in our study. 21–25 years age group had a high prevalence of normal, grade I HTNR, grade 3

HTNR and macular oedema in their fundus findings. Grade 2 HTNR was more common in the age group of 26–30 years. In our study, retinal detachment was observed one each in the age group 26–30 and 18–20 years. (Table – II)

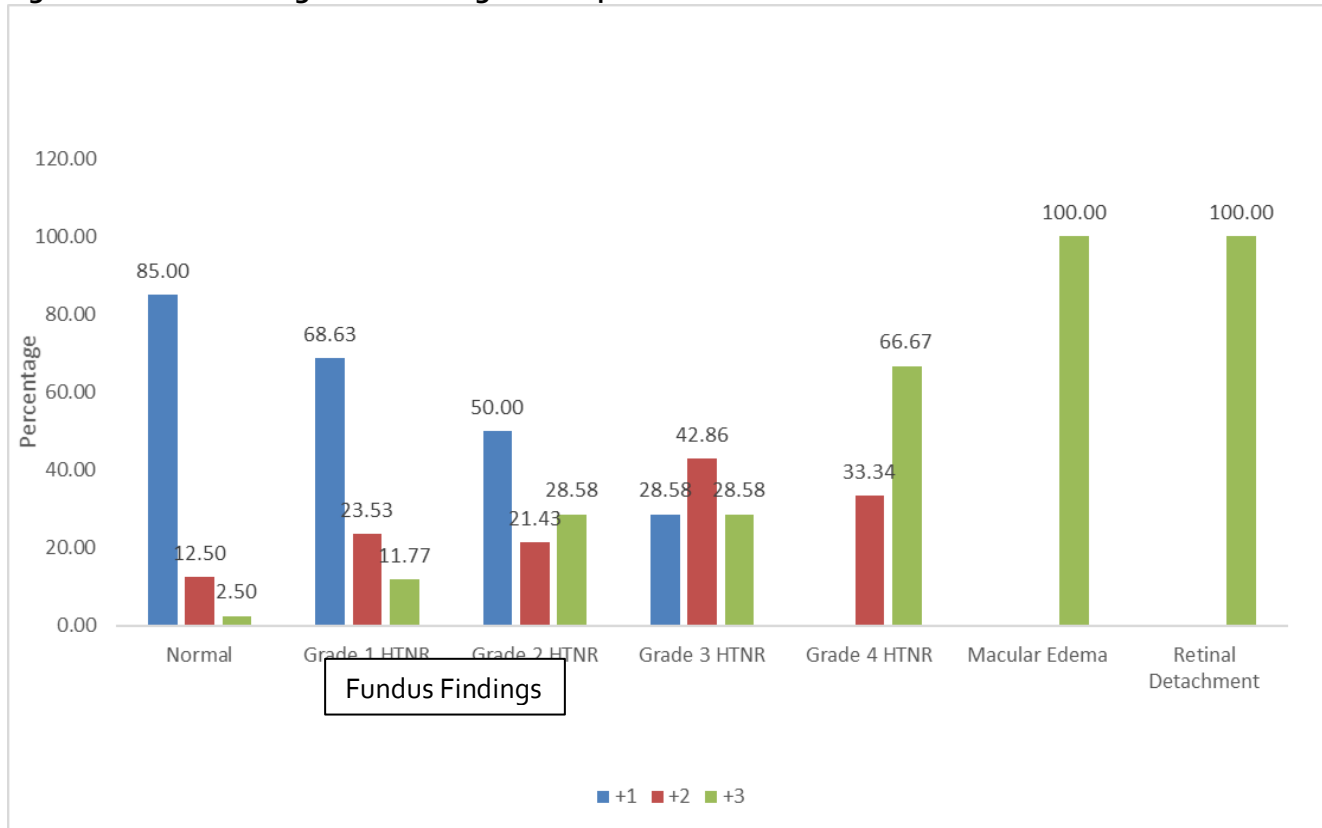
Table II: Fundus findings in different age groups in our study

| Fundus Finding | <20 (n) (%) | 21-25 (n) (%) | 26-30 (n) (%) | 31-35 (n) (%) | 36-40 (n) (%) | >40 (n) (%) | Total |
|--------------------|----------------|------------------|------------------|------------------|------------------|----------------|-------|
| Normal | 6(15.00) | 18 (45.00) | 13 (32.50) | 2(5.00) | 1(2.50) | 0(0) | 40 |
| Grade 1 HTNR | 5(9.44) | 24 (45.29) | 19 (35.85) | 3(5.67) | 1(1.89) | 1(1.89) | 53 |
| Grade 2 HTNR | 2(7.15) | 10 (35.72) | 11 (39.29) | 5 (17.86) | 0(0) | 0(0) | 28 |
| Grade 3 HTNR | 2(14.29) | 6(42.86) | 5(35.72) | 1(7.15) | 0(0) | 0(0) | 14 |
| Grade 4 HTNR | 0(0) | 3(33.34) | 4(44.45) | 0(0) | 1(11.12) | 1(11.12) | 9 |
| Macular Oedema | 0(0) | 2(50) | 2(50) | 0(0) | 0(0) | 0(0) | 4 |
| Retinal Detachment | 1(50.00) | 0(0) | 1(50) | 0(0) | 0(0) | 0(0) | 2 |
| Total | 16 | 63 | 55 | 11 | 3 | 2 | 150 |

Chi square = 26.135; do = 30; p: 0.6682

Macular oedema and retinal detachment were observed in grade +3 proteinuria. (Figure - II)

Figure II: Fundus findings in different grades of proteinuria.



DISCUSSION

Severity of hypertension can be very well correlated with the changes in retinal vasculature. Hence, they act as guidelines for termination of pregnancy, as they may reflect similar placental ischaemic vascular changes.

Age grouping of Pregnancy Induced Hypertension

Mean age of the cases in our study was 26 ± 4.64 years, which matches with the prospective cohort studies conducted by Karki et al.¹² and Shukla et al.¹³.

Tadin et al.¹⁴. The average age of patients was 29.1 ± 7.4 years. In a study by Jaffe and Schatz et al.¹⁵, the mean age of patients with pre-eclampsia was 28 years. Mean age of patients in studies by Tadin et al.¹⁴, Jaffe, and Schatz was higher than our study of mean age probably due to the most of the cases being higher than 25 years.

Severity of hypertension

In the studies by Tadin et al.¹⁴, Mithila R. et al.¹⁶, and Reddy et al.¹⁷ the percentage of occurrence of retinal vascular changes in mild pre-eclampsia was higher than our study. Tadin et al.¹⁴, Mithila R. et al. and Reddy et al.¹⁷ in their study found eclampsia cases with retinal vascular changes. This is lower than that found in our study. In our study, eclampsia cases were higher than mild preeclampsia but, in their study, higher number of mild preeclampsia cases.

Prevalence Rate

The prevalence rate of fundus changes was found 73.30% while in Tadin et al.¹⁴, Reddy et al.¹⁷, Zehra Kurdoglu et al.¹⁸, Javadekar study¹⁹ and Karki et al.¹¹ noted prevalence rate 45%, 59%, 48%, 72% and 13.7% respectively. Incidence of Pregnancy Induced Hypertension in Bhattacharya et al.²⁰ study was 15.5%, Study by Shalini et al.²¹ has reported preeclampsia in 7%-10% and eclampsia in 0.7%-1.80% patients. In Kaur et al.²² study incidence was 13(26%) out of 50 patients with Pregnancy Induced Hypertension.

Fundus changes in Pregnancy Induced Hypertension

Pregnancy Induced Hypertension causes a varied spectrum of fundus changes which can cause diminution of vision to severe loss of vision. In our study retinal changes were found in 73.30%. Tadin et al.¹⁴ from Croatia, He reported it to be 45% of in his study of 40 patients with pregnancy induced hypertension. Also found a statistical correlation between proteinuria, blood pressure and hypertensive retinopathy and degree of retinopathy was Severity of preeclampsia directly proportional to degree of retinopathy¹⁴. Hypertensive retinopathy was the most frequently noticed finding seen in 50% of our patients.



Hutchings et al.²³, and Fastenberg studies.²⁴ also suggested Retinal detachment is a consequence of choroidal vascular damage. We also noted 2 cases of exudative retinal detachment in the eclampsia group which were similar to their study.

Grades of hypertensive retinopathy

Reddy from India¹⁷, he reported retinal changes in 53.4% preeclampsia and in 71.2% eclampsia patients. The most common fundus finding they noticed was narrowing of arterioles (45.7%). Mithila R. et al.¹⁶ in their study on 100 Pregnancy Induced Hypertension patients reported 34% patients, 13% and 3% patients with grade 1, grade 2 and grade 3 hypertensive retinopathy changes respectively.

In our present study, 35.30% had grade 1, 18.67% had grade 2, 9.34% had Grade 3 and 6% had grade 4 hypertensive retinopathy. There were 2 cases of exudative retinal detachment and 4 cases of macular oedema. Termination of pregnancy was advised for grade 4 retinopathy patients. After a week of termination of pregnancy, fundus picture showed no disc oedema. Superficial haemorrhages and cotton wool spots were present, but were resolving.

Proteinuria

Our study was similar to another study of Bhandari A.J. et al. study.²⁵ We observed a significant association between proteinuria and fundus changes. ($p < 0.0001$).

Our study results were similar to that of another study of Reddy et al.¹⁶, Tadin et al.¹³ study and Bhandari A.J. study.²⁵

CONCLUSION

Severity of disease in cases of Pregnancy Induced Hypertension assessed with the help of simple tools like ophthalmoscopy that can help obstetricians for further management. There is significant correlation with the severity of disease and the levels of hypertension. Most of the cases fundus changes are under-diagnosed. Timely Fundus examination should be carried out in all cases of Pregnancy Induced Hypertension as it would affect the decision of induction of delivery, and prevent other complications. Higher the BP and grade of proteinuria more severe the grades of retinopathy in Pregnancy Induced Hypertension patients. In pregnancy Induced Hypertension, complications like serous retinal detachment continue to occur, causing ocular morbidity in a physiological state like pregnancy. Foetal prognosis can be predicted by retinal vasculature changes as it reflects similar disease in the placental microcirculation. In all the patients of pregnancy induced hypertension ocular fundus examination is important for further management.



REFERENCES

1. James PR, Nelson-Piercy C. Management of Hypertension before, during, and after pregnancy. *Heart*. 2004; 90:1499–1504.
2. Khan KS, Wojdyla D, Say L, et al. WHO analysis of causes of maternal death: a systematic review. *Lancet*. 2006; 367:1066–1074.
3. Berg CJ, Harper MA, Arkinson SM, et al. Preventability of pregnancy-related deaths. *Obstet Gynecol*. 2005; 106:1228–1234.
4. Sharma C, Gupta S, Tyagi M, Mani P, Dhingra J, Rana R. Maternal and perinatal outcome in hypertensive disorders of pregnancy in a tertiary care hospital in northern India. *Obstet Gynecol Int J* 2017; 6:00229.
5. Abalos E, Cuesta C, Carroli G, Qureshi Z, Widmer M, Vogel JP, et al. Pre-eclampsia, eclampsia and adverse maternal and perinatal outcomes: A secondary analysis of the World Health Organization Multi country Survey on Maternal and Newborn Health. *BJOG* 2014;121 Suppl 1:14-24.
6. Fiona M, Chris R, James W, et al. The pre-eclampsia community guideline (PRECOG): How to screen for and detect onset of pre-eclampsia in the community. *BMJ* 2005; 30:576–580.
7. Wallis AB, Saftlas AF, Hsia J, et al. Secular trends in the rates of preeclampsia, eclampsia, and gestational hypertension, United States, 1987–2004. *Am J Hypertens*. 2008; 21:521–526.
8. National Institute of Health and Clinical excellence. 2010. Hypertension in pregnancy: The management of hypertensive disorders during pregnancy. CG no 107. London: National Institute of Health and Clinical excellence.
9. NHBPEP (National High Blood Pressure Education Program) Working Group on High Blood Pressure. Report of the National High Blood Pressure Education Program Working Group in High Blood Pressure in Pregnancy. *Am J Obstet Gynecol*. 2000;183: S1–22.
10. American College of Obstetricians & Gynaecologists. Diagnosis and Management of Preeclampsia and Eclampsia. Practice Bulletin No.33. Washington, DC: ACOG, January 2002.
11. [arias textbook of obstetrics and gynaecology 25th edition]
12. Karki P, Basnet PS, Basnet A, Sijapati MJ, Manish KC, Pokharel K. Fundus Changes In Pregnancy Induced Hypertension. *Journal of Universal College of Medical Sciences*. 2017;5(1):42-4.
13. Shukla D, Maheshwari R, Ramchandani B, Kanungo S. Purtscher-like retinopathy with serous retinal detachment in preeclampsia of pregnancy: complications and management. *Retinal Cases and Brief Reports*. 2010;4(4):332-5.
14. Tadin I, Bojić L, Mimica M, Karelović D, Đogaš Z. Hypertensive retinopathy and pre-eclampsia. *Collegium antropologicum*. 2001;25(1):77-81.
15. Jaffe G, Schatz H. Ocular manifestations of preeclampsia. *American journal of ophthalmology*. 1987;103(3):309-15.
16. Mithila R, Datti NP, Gomathy E, Krishnamurthy D. Study of association of fundal changes and fetal outcomes in preeclampsia. *Journal of Evolution of Medical and Dental Sciences*.2014; 3(21), 5894+
17. Reddy SC, Nalliah S, Who TS. Fundus changes in pregnancy induced hypertension. *International journal of ophthalmology*. 2012;5(6):694.
18. Kurdoglu Z, Ozkol H, Kurdoglu M, Kamaci M. Evaluation of the relationship between adenosine deaminase, myeloperoxidase, cholinesterase, preeclampsia severity, and neonatal outcomes. *Clinical and experimental hypertension*. 2012;34(7):493-7.
19. Javadekar SD, Javadekar DP, Joshi K, Khatiwala R. Fundoscopic changes in pregnant mother with hypertension complicating pregnancy and various parameters of foetus. *Int J Recent Trends Sci Technol*. 2013;7(3):110-3.
20. Bhattacharya S, Prescott GJ, Iversen L, Campbell DM, Smith WC, Hannaford PC. Hypertensive disorders of pregnancy and future health and mortality: a record linkage study. *Pregnancy Hypertension: An International Journal of Women's Cardiovascular Health*. 2012;2(1):1-7.
21. Shalini S, Mehrotra A, Singh P. Association of Serum Lactate Level with Severity of Pre-Eclampsia and Maternal Complications: An Observational Study. *International Journal of Pharmaceutical and Clinical Research*.2022; 14(10); 450-456.
22. Kaur G, Mishra S, Sehgal A, Prasad R. Alterations in lipid peroxidation and antioxidant status in pregnancy with preeclampsia. *Molecular and cellular biochemistry*. 2008; 313:37-44.
23. Hutchings K, Sangalli M, Halliwell T, Tuohy J. Bilateral retinal detachment in pregnancy. *Australian and New Zealand journal of obstetrics and gynaecology*. 2002;42(4):411-3.
24. Fastenberg DM, Ober RR. Central serous choroidopathy in pregnancy. *Archives of Ophthalmology*. 1983;101(7):1055-8.
25. Bhandari AJ, Bangal SV, Padghan DD, Gogri PY. Relation of ocular fundus changes with blood pressure and proteinuria in pregnancy induced hypertension. *Egyptian Retina Journal*. 2014;2(3):97.