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Analysis of Retinopathy of Prematurity in a Tertiary Care Hospital

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Authors' contributions

This work was carried out in collaboration between all authors. Authors RD and UM designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors UM and RR managed the analyses of the study. Author RR managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Aim: To analyse different parameters responsible for occurrence of retinopathy of prematurity (ROP) in neonatal care unit of a tertiary care hospital and to study the associated risk factors.
Materials and Methods: A prospective analytical study was carried out at NICU of KIMS Hospital Hubli, Karnataka. A total of 140 babies with gestational age at birth less than 34 weeks and birth weight less than 1750 grams were examined. Associated prenatal, intranatal and postnatal history was noted down.
Results: Incidence of ROP was found to be 27.14%. Among 140 babies screened. ROP was found in 38 babies among which 20 were males and 18 were females. Stage 1 ROP was in 11 babies (7.85%), stage 2 ROP in 24 babies (17.14%), stage 3 ROP in 2 babies (1.42%) and Aggressive Posterior Retinopathy of Prematurity (APROP) was found in 1 baby (0.71%). Factors which were having association with ROP by univariate analysis are gestational age at birth (p=0.005), birth weight (p=0.005), respiratory distress syndrome (RDS) (p=0.017), oxygen therapy (p=0.020), sepsis (p=0.001) and blood transfusion (p=0.002). Among them factors which were having independent association by multivariate analysis are birth weight (p=0.007, Odds ratio 12.581), sepsis (p=0.022, Odds ratio 5.427), blood transfusion (p=0.009, Odds ratio 23.054).

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Conclusion: Incidence of ROP among screened babies is significant. All high risk babies should be screened for ROP and all eligible babies should be advised treatment. Risk factors which were having independent association with ROP are birth weight, sepsis and blood transfusion.

Keywords: Retinopathy of Prematurity (ROP); Intra Uterine Growth Retardation (IUGR); birth asphyxia; oxygen therapy; Lower Segment Caesarean Section (LSCS); gestational age at birth; birth weight; APROP; RDS.

ABBREVIATIONS

NICU : Neonatal intensive care unit.
KIMS : Karnataka institute of medical sciences.
ROP : Retinopathy of prematurity.
APROP : Aggressive posterior retinopathy of prematurity.
IUGR : Intrauterine growth retardation.
LSCS : Lower segment caesarean section.
RDS : Respiratory distress syndrome.
CPAP : Continuous positive airway pressure.
2, 3 DPG : 2, 3 - bisphosphoglyceric acid.
Hb : Haemoglobin

1. INTRODUCTION

Retinopathy of prematurity (ROP) is a disorder of developing retinal vessels.It is emerging as one of the leading causes of preventable blindness and accounts for up to 10% of childhood blindness in developed countries [1]. Terry first described the disease as retrolental fibroplasia in 1942 [2]. Incidence of ROP is increasing since the time when it was first described because of improved neonatal care which had increased the survival of low birth weight and premature infants [3]. Countries like India which is having highest number of preterm births have ROP as a major cause of blindness [4]. Visual outcomes of higher stages of ROP are poor even after treatment. Therefore there is a need to detect ROP at its earliest stage so that appropriate treatment can be given and there is need to study the risk factors associated so that the disease can be prevented. Present study is carried out to analyse the different parameters responsible for the occurrence of ROP and to study associated risk factors.

1.1 Aims and Objectives

To analyse the different parameters responsible for occurrence of ROP in high risk babies.

1.2 Inclusion Criteria

Babies who were having gestational age at birth less than 34 weeks and birth weight less than 1750 grams.

1.3 Exclusion Criteria

Babies who were having congenital cataract and other congenital malformations.

2. MATERIALS AND METHODS

This study was conducted among 140 babies who were admitted in NICU of KIMS Hospital Hubli. Appropriate history of prenatal, intranatal and postnatal events were recorded for each baby. After examining the anterior segment and pupillary reactions, pupils were dilated using tropicamide (0.8%) and phenylephrine (5%) eye drops, instilled 3-4 times in both eyes 10 minutes apart. After full dilatation of pupil both eyes fundus examination was done with indirect ophthalmoscope with +20 D lens and also with Retcam shuttle. Sterile Alfanso speculum was used for retracting the eyelids and paracaine (0.5%) eye drops were used for decreasing the pain and discomfort during the examination. Sterile scleral depressor was used to examine the periphery of retina. Findings were noted down describing the stage, zone of ROP and clock hours involved.

3. RESULTS

Total 140 eligible babies were screened which were born in the period between December 2015 to December 2016. The gestational age at birth ranges from 25 weeks to 34 weeks and birth weight ranges from 870 grams to 1750 grams. ROP was detected in 38 babies among them 20 were males and 18 were females. Stage 1 ROP was in 11 babies (7.85%), among them, 6 were in zone 2 and 5 were in zone 3. Stage 2 ROP was in 24 babies (17.14%), among them one was in zone 1, 21 were in zone 2 and 2 were in zone 3. Stage 3 ROP was found to be in 2 babies (1.42%) both were in zone 2. APROP was found in one baby who was in zone 2.93 babies (65.71%) were having temporal avascular retina, but no stage ROP was present. Rest 9 babies (6.42%) fundus was found to be almost fully vascularised.

Pie chart showing frequency distribution of stages of ROP.

Baby with APROP was advised laser photocoagulation as early as possible. Stage 1 and stage 2 ROP cases were advised follow up visit after 2 weeks. Stage 3 ROP cases were advised follow up visit after 1 week. 93 babies which were having temporal avascular retina were advised follow up visit after 3 weeks. 9 babies (6.42%) were having almost fully vascularised retina, hence no any follow up visit was advised.

Stage 4 ROP, stage 5 ROP was not found in any of the baby screened in this study. All diagnosed ROP cases were symmetrical (same stage was present in both eyes).

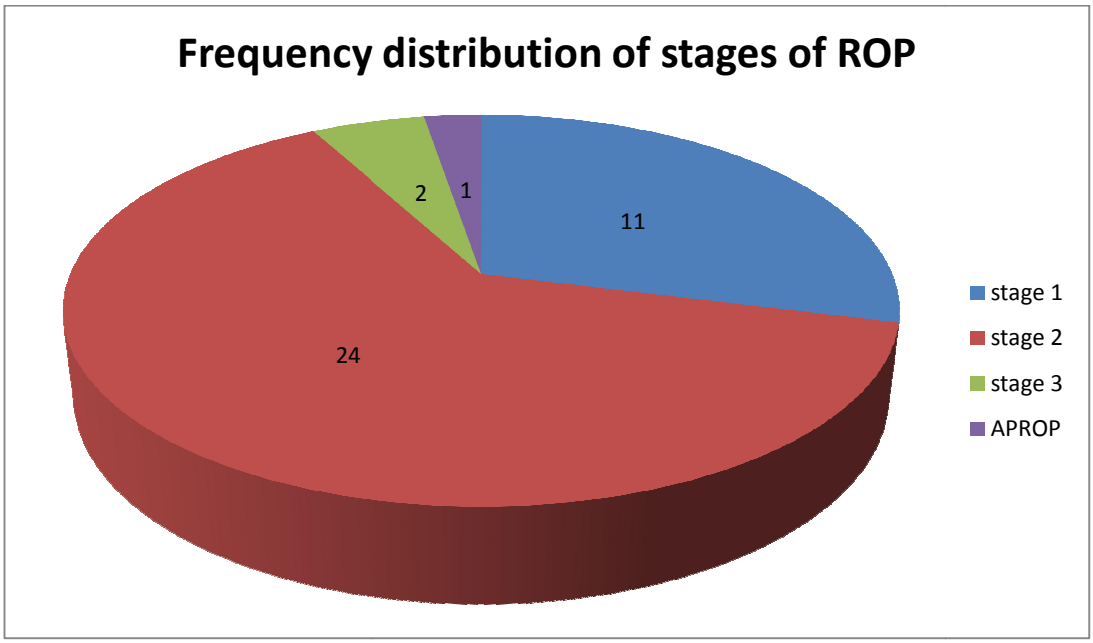
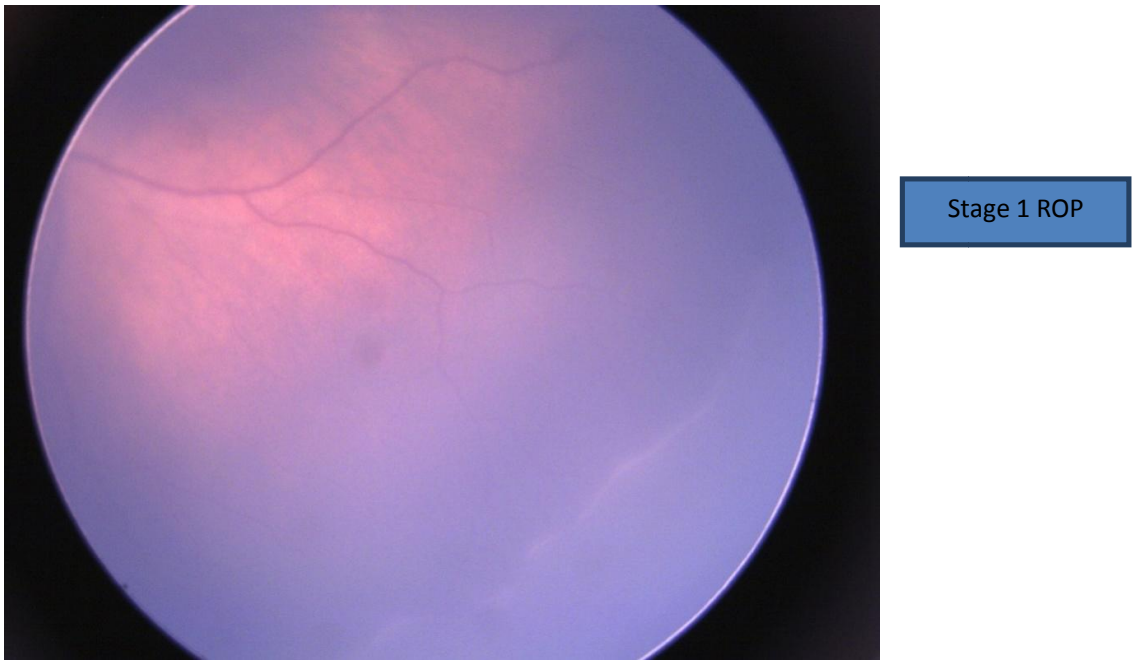


Fig. 1. Frequency distribution of stages of ROP



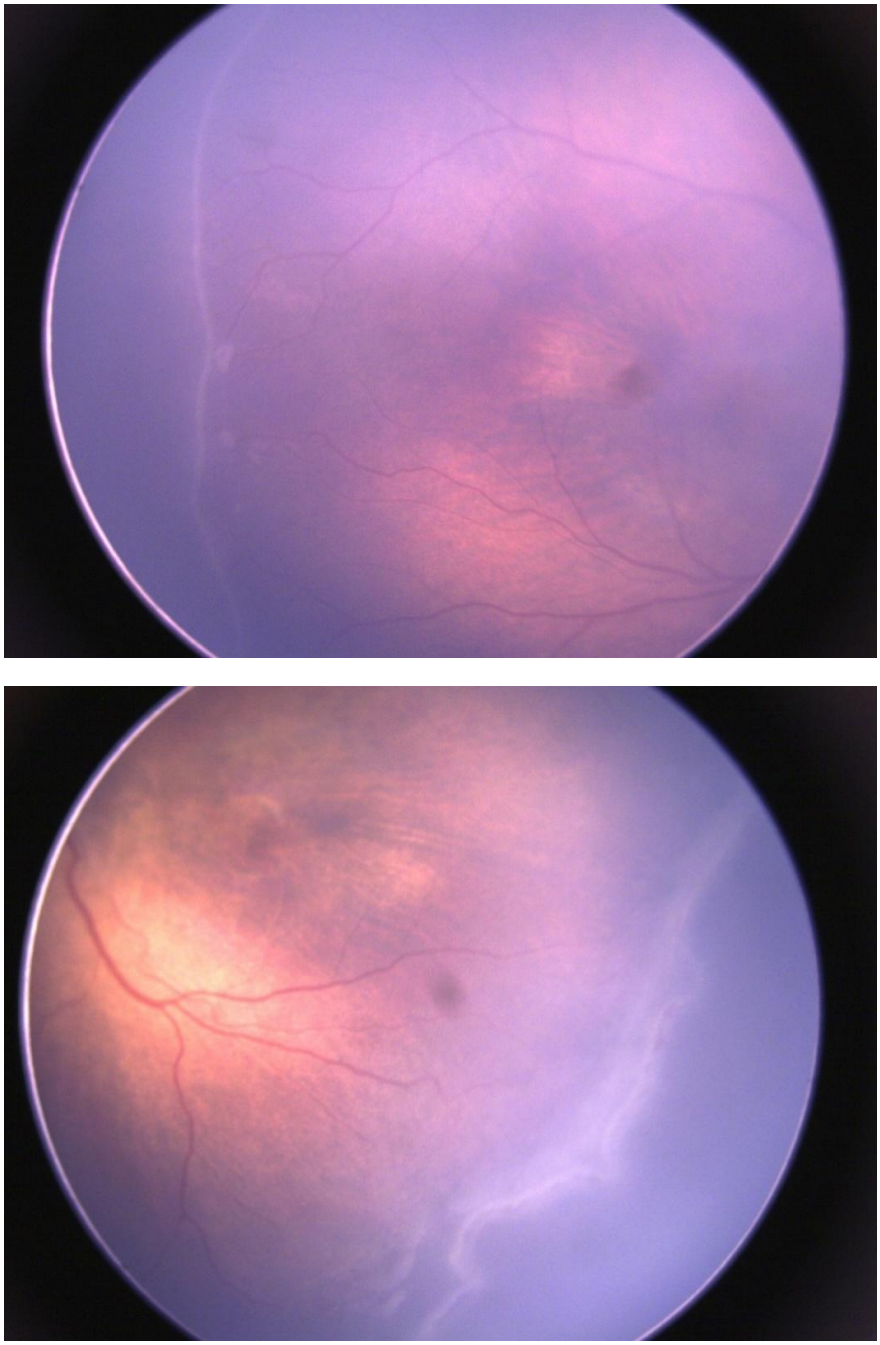


Fig. 2. Fundus images showing Stage 1, Stage 2 and Stage 3 ROP

3.1 Risk Factors

Most common risk factor apart from prematurity and low birth weight in this study was respiratory distress syndrome (RDS) which was present in 50% of all diagnosed ROP babies. Second most common risk factor was oxygen therapy which was present in 44.73% of all ROP babies. Frequency of all risk factors in ROP babies is given in following Table 1.

On analysing the data by univariate analysis it was found that factors which are having significant association with ROP are gestational

age at birth (p=0.005), weight in grams (p=0.017), oxygen therapy (p=0.020), sepsis (p=0.005), Respiratory Distress Syndrome (p=0.001) and blood transfusion (p=0.002).

Table 1. Frequency of risk factors in babies with ROP

Risk factor	Frequency in diagnosed ROP babies
Respiratory distress syndrome	19 (50.00%)
Oxygen therapy	17 (44.73%)
Multiple gestation	11 (28.94%)
Sepsis	08 (21.05%)
Birth Asphyxia	06 (15.78%)
Neonatal jaundice	05 (13.15%)
Blood transfusion	05 (13.15%)
Intra uterine Growth Retardation (IUGR)	03 (7.89%)
Lower Segment Caesarean Section (LSCS)	04(10.52%)

Table 2. Univariate analysis of risk factors in ROP

	ROP	**Present**	**Absent**	**Total**	**Chi square test**
Gender	Male	21 (55.26)	56 (54.9)	77 (55)	p = 0.970
	Female	17 (44.74)	46 (45.1)	63 (45)	
	ROP	**Present**	**Absent**	**Total**	**Fisher exact test**
Gestational age	25-27 weeks	4 (10.53)	1 (0.98)	5 (3.57)	p= 0.005
at birth in weeks	28-30 weeks	19 (50)	37 (36.27)	56 (40)	**(Significant)**
	31-34 weeks	15 (39.47)	64 (62.75)	79 (56.43)	
	ROP	**Present**	**Absent**	**Total**	**Fisher exact test**
Weight in grams	<1000 grams	3 (7.89)	1 (0.98)	4 (2.86)	P<0.005
	1000-1399 grams	17 (44.74)	19 (18.63)	36 (25.71)	**(Significant)**
	1400 grams & above	18 (47.37)	82 (80.39)	100 (71.43)	
	ROP	**Present**	**Absent**	**Total**	**Chi square test**
RDS	Present	19 (50)	29 (28.43)	48 (34.29)	p = 0.017
	Absent	19 (50)	73 (71.57)	92 (65.71)	**(Significant)**
	ROP	**Present**	**Absent**	**Total**	**Chi square test**
Oxygen therapy	Present	17 (44.74)	25 (24.51)	42 (30)	p = 0.020
	Absent	21 (55.26)	77 (75.49)	98 (70)	**(Significant)**
	ROP	**Present**	**Absent**	**Total**	**Chi square test**
Twin	Present	11 (28.95)	21 (20.59)	32 (22.86)	p = 0.295
	Absent	27 (71.05)	81 (79.41)	108 (77.14)	
	ROP	**Present**	**Absent**	**Total**	**Chi square test**
Sepsis	Present	8 (21.05)	4 (3.92)	12 (8.57)	p = 0.001
	Absent	30 (78.95)	98 (96.08)	128 (91.43)	**(Significant)**
	ROP	**Present**	**Absent**	**Total**	**Chi square test**
Asphyxia	Present	6 (15.79)	10 (9.8)	16 (11.43)	p = 0.322
	Absent	32 (84.21)	92 (90.2)	124 (88.57)	
	ROP	**Present**	**Absent**	**Total**	**Chi square test**
Jaundice	Present	5 (13.16)	10 (9.8)	15 (10.71)	p = 0.568
	Absent	33 (86.84)	92 (90.2)	125 (89.29)	
	ROP	**Present**	**Absent**	**Total**	**Chi square test**
Blood	Present	5 (13.16)	1 (0.98)	6 (4.29)	p = 0.002
transfusion	Absent	33 (86.84)	101 (99.02)	134 (95.71)	**(Significant)**
	ROP	**Present**	**Absent**	**Total**	**Chi square test**
IUGR	Present	3 (7.89)	10 (9.8)	13 (9.29)	p = 0.729
	Absent	35 (92.11)	92 (90.2)	127 (90.71)	
	ROP	**Present**	**Absent**	**Total**	**Chi square test**
LSCS	Present	4 (10.53)	15 (14.71)	19 (13.57)	p = 0.521
	Absent	34 (89.47)	87 (85.29)	121 (86.43)	

Table 3. Logistic regression multivariate analysis of risk factors in ROP

		Adjusted odds ratio	95% C.I. for EXP(B)		P value	Unadjusted odds ratio
			Lower	Upper		
Gestational age at birth	25-27 weeks	4.502	0.316	64.124	0.267	17.06
	28-30 weeks	1.386	0.514	3.74	0.519	2.19
	31-34 weeks	(Reference)				
Birth Weight in grams	<1000	12.581	0.865	182.898	0.064	13.67
	1000-1399	3.977	1.464	10.805	0.007 **(Significant)**	4.07
	1400-1750	(Reference)				-
RDS		0.818	0.147	4.552	0.819	2.51
Oxygen therapy		3.202	0.603	17.009	0.172	2.49
Sepsis		5.427	1.281	22.987	0.022 **(Significant)**	6.53
Blood transfusion		23.054	2.191	242.598	0.009 **(Significant)**	15.30

On analyzing the data by logistic regression multivariate analysis, factors which are having independent association with ROP are birth weight (p=0.007, Odds ratio 12.581), sepsis (p=0.022, Odds ratio 5.427), blood transfusion (p=0.009, Odds ratio 23.054).

4. DISCUSSION

Incidence and severity of ROP is increasing in developing nations like India [5]. Incidence in present study is found to be 27.14%. It varies in different studies; the reason might be due to differences in gestational age, birth weight, quality of infant survival and health care activities and other related factors such as ethnicity and race, limited sample size, loss to follow up.

Strong risk factors for development of ROP are low gestational age at birth, low birth weight. Other risk factors are oxygen therapy, respiratory distress syndrome, twin delivery, sepsis, anaemia, blood transfusion [6,7,8,9].

The risk factors which we found significant by univariate analysis are low gestational age at birth (p=0.005), birth weight (p=0.005), respiratory distress syndrome (p=0.017), oxygen therapy (p=0.020), sepsis (p=0.001) and blood transfusion (p=0.002).

As birth weight decreases, incidence and severity of ROP increases as found in different studies [10]. Even after logistic regression multivariate analysis birth weight remained a significant risk factor for ROP in our study. (p=0.007, Odds ratio 3.977).

Sepsis is frequently accompanied by hypotension which impairs the tissue perfusion and release of angiogenic growth factors [11]. In our study sepsis is found to be an independent risk factor for ROP (p=0.022, Odds ratio 5.429).

Premature and low birth weight babies are often accompanied by anaemia which increases the need for transfusion of packed cell volume. Adult RBCs are rich in 2,3 DPG and adult Haemoglobin (Hb) binds less firmly to oxygen, thus releasing excess oxygen to the retinal tissue [12]. Blood transfusion is an independent risk factor for ROP in our study (p=0.009, Odds Ratio 23.054).

According to Murthy et al oxygen therapy in the form of mechanical ventilation and Continuous Positive Airway Pressure (CPAP) were not the independent risk factor for development of ROP [13]. In our study we found that it is a significant risk factor on univariate analysis but it is not an independent risk factor on multivariate analysis. (p=0.172, adjusted Odds ratio 3.202).

According to study conducted by Brian et al male gender is one of the risk factor for ROP [14]. But in our study we found that there is no any statistical correlation between gender of the baby and ROP (p=1.014).

We also found there is no any statistical association between occurrence of ROP and twin delivery (p=0.295), birth asphyxia (p=0.322), jaundice (p=0.568), Intra uterine growth retardation (IUGR) (p=0.729) and Lower Segment Caesarean Section (LSCS) (p=0.521).

Stage 2 in zone 2 was the commonest pattern of ROP in our study and all diagnosed ROP babies were having same stage of ROP in both eyes i.e. the disease was symmetrical.

5. CONCLUSION

Incidence of ROP in present study is significant. Treating established ROP is more difficult than screening early stages of ROP. It is a potentially blinding disease which can be prevented if it is detected at earliest stage by regular screening and follow up of high risk babies. In this manner vision of high risk babies can be saved.

CONSENT

All authors declare that written informed consent was obtained from the mother / father of the baby for publication of this paper and accompanying images.

ETHICAL APPROVAL

As per international standard or university standard, written approval of Ethics committee has been collected and preserved by the authors.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Goggin M, O'Keefe M. Childhood blindness in the Republic of Ireland; a national survey. Br J Ophthalmol. 1991;75: 425-49.
2. Terry TL. Fibroblastic overgrowth of persistent tunica vasculosa lentis in infants born prematurely: II. Report of Cases-Clinical Aspects. Trans Am Ophthalmol Soc. 1942;40:262–284.
3. Parag K Shah, Vishma Prabhu, Smita Karandikar. Retinopathy of prematurity: Past, present and future. World J Clin Pediatr. 2016;5(1):35–46.
4. Born Too Soon. The global action report on preterm birth. Geneva: World Health Organization; 2012.
5. Rudolph S Wagner, Editor. Increased incidence and severity of retinopathy of prematurity in developing nations. Journal of Paediatric Ophthalmology and Strabismus. 2003;40(4):193.
6. Maheshwari R, Kumar H, Paul VK, Singh M, Deorari AK, Tiwari HK. Incidence and risk factors of retinopathy of prematurity in a tertiary care newborn unit in New Delhi. Natl Med J India. 1996;9:211-4.
7. Chaudhari S, Patwardhan V, Vaidya U, Kadam S, Kamat A. Retinopathy of prematurity in a tertiary care centre-incidence, risk factors and outcome. Indian Pediatr. 2009;46:219-24.
8. Aggarwal R, Deorari AK, Azad RV, et al. Changing profile of retinopathy of pre-maturity. J Trop Pediatr. 2002;48:239-42.
9. Rekha S, Battu RR. Retinopathy of prematurity: Incidence and risk factors. Indian Pediatr. 1996;33:999-1003.
10. Lundgren, Anna Kistner, Eva Anderson, et al. Low birth weight is a risk factor for severe retinopathy of prematurity depending on gestational age. PLoS One. 2014;9(10):e109460.
DOI: 10.1371/journal.pone.0109460
11. Madhur Mittal, Ramasubbareddy. Candida sepsis and association with retinopathy of prematurity. American Academy of Paediatrics. 1998;101(4).
12. Abdel HAA Hakeem, Gamal B Mohamed, Mohamed F Othman. Retinopathy of prematurity, a study of prevalence and risk factors; Middle East Afr J Ophthalmol. 2012;19(3):289–294.
DOI: 10.4103/0974-9233.97927
13. Murthy KR, Nagendra, Babu K, Benakappa N, Niranjan, Murthy PR. Analysis of risk factors for the development of ROP in preterm infants at a tertiary referral hospital in South India. Acta Medical Litunica. 2006;13:147-51.
14. Brian A Darlow, Jolie I, Hutchinson. Prenatal risk factors for severe retinopathy of prematurity among very preterm infants of the Australian and New Zealand neonatal network. American Academy of Paediatrics; 2005.

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