



## Original Research Article

## Prevalence and risk factors of retinopathy of prematurity in Western Maharashtra

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## ABSTRACT

**Background:** ROP is a disease of the developing immature blood vessels in the retina of premature newborn by toxicity of oxygen. With the recent advances in neonatal care there has been improvement in rates of survival in premature infants. Factors playing a role in ROP are low gestational age, low birth weight and increased oxygen supplementation after birth.

**Aims:** To study the prevalence of retinopathy of prematurity and to determine its risk factors.

**Materials and Methods:** A prospective study was conducted in a tertiary centre from September 2018 to August 2020. 60 babies were screened with birth weight less than 1500 gms and gestational age less than 32 weeks. History was taken from parents and fundus examination was done. The grading of stages and zones was done. Data was entered in Excel and tests of statistical significance were used.

**Results:** The prevalence of ROP was 28%. ROP was seen in zone III in 70% and 47% had stage 2 ROP. Only 7% mothers had completed less than 28 weeks of gestation. The mean birth weight was 1.36 kgs. 71% of the ROP positive babies were delivered by normal vaginal delivery. 100% babies diagnosed with ROP had been subjected to oxygen supplementation. 47% babies developed sepsis whereas 76% babies had history of RDS.

**Conclusion:** ROP is a preventable cause of blindness in childhood. Early screening by an ophthalmologist is important to prevent this. The burden of ROP is bound to rise due to increased advances in the field of neonatology if screening protocols are not implemented stringently.

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## 1. Introduction

Retinopathy of prematurity (ROP) is a disease of the developing immature blood vessels in the retina of baby born prematurely caused by toxicity of oxygen. These blood vessels are abnormal which makes them fragile and friable. This causes leakage or bleeding, further leading to retinal detachment. This is the major cause of blindness in ROP.

ROP is seen in premature infants as in them retinal blood vessels have still an incomplete growth of vessels. As in various retinopathies like sickle cell retinopathy and proliferative diabetic retinopathy, oxygen plays an important role in ROP as well. Incidence of ROP has an

inverse correlation with gestational age and birth weight. If oxygen concentrations are in an excess, it can cause vasoconstriction of retina. It has been observed that oxygen saturation is a controllable factor, which if kept low can prohibit the advancement of ROP.<sup>1</sup>

Studies done in western regions show that incidence of ROP ranges from 21 to 65.8%.<sup>1,2</sup> Whereas according to studies done in India, the incidence of ROP is from 38-51.9% in babies with low birth weight.<sup>3,4</sup> In baby with birth weight less than 900 grams, the ROP incidence has increased and it is now a very big cause of avoidable neonatal blindness.<sup>5</sup> In newborns born at less than 25 weeks, the incidence is as high as 80-100%.<sup>6</sup>

With the recent advances in the last decade in neonatal care there has been improvement in rates of survival in

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premature infants. Consequently, ROP prevalence is rising. Risk factors of ROP are low gestational age, low birth weight and increased oxygen supplementation after birth.

According to these risk factors screening of infants born less than 32 weeks gestation or 1500 grams is advised with adequate follow up.<sup>7, 8</sup> In India, ROP is the main reason of childhood blindness.<sup>9</sup> Vision 2020 was introduced in 1999, in which five priority areas were set and childhood blindness was one of them.<sup>10,11</sup>

Screening for early identification of retinal damage should be performed preferably by ophthalmologist for early detection of this preventable blindness. Screening protocols are still lacking in India and other developing countries. This cause of blindness will only keep rising in these countries, if steps are not taken immediately to improve the screening protocols.<sup>12</sup>

## 2. Materials and Methods

This was a hospital-based prospective study conducted on patients attending the OPD of Dr. D.Y.Patil Medical College & Research Institute, Pune from September 2018 to August 2020. A total of 60 babies were screened for ROP. All babies with birth weight less than 1500 gms and gestational age less than 32 weeks were included in the study. Infants with congenital anomalies, chromosomal abnormalities, inborn errors of metabolism were excluded from the study.

Before screening and definitive examination, the study was explained in detail to all the participants (parents). Written assent was obtained from all the participants (in this case from the parents of the participating infants).

After explaining the study to all the participants (parents) in detail written assent was obtained from all the participants. Detailed history was taken from parents including mechanical ventilation, apnoea, sepsis, intraventricular haemorrhage, surfactant therapy, anaemia, frequent blood transfusions, multiple birth, pulmonary insufficiency among others and documentation was done in the proforma.

The pupils of the babies were dilated using tropicamide 0.5% and phenylephrine 2.5% (after dilution). Topical anaesthetic (paracaine) was instilled and a paediatric wire speculum was applied. The fundus examination was carried out using indirect ophthalmoscope and the grading for the severity (stages) and location (zones) was done. The babies were called for follow up depending upon the severity of ROP.

### Statistical analysis

Data was entered in Excel and analysed using WinPepi software and was summarised using mean and SD. Appropriate tests of statistical significance such as chi-square, test, paired t test were used.

## 3. Results

22 (36.7%) mothers out of 60 were completed 31-32 weeks of gestational age. 18 (30%) mothers had completed 30-31 weeks of gestation, 10 (16.7%) mothers had completed 29-30 weeks of gestation, 6 (10%) mothers had completed 28-29 weeks and 4 (6.7%) mothers had completed less than 28 weeks of gestation.

Mean birth weight of newborns of gestational age 32 weeks or less out of 60 study sample was 1.36 kg (Standard deviation — 0.12 kg), with the highest 1.5 kg and lowest 1.1 kg. There were 30 (50%) females and 30 (50%) males in the study. Only 6 (35%) out of 17 babies with ROP had a family history of ROP in their siblings.

Total 60 babies were examined in this study and all babies had birth weight less than or equal to 1.5 kgs and gestational age of less than or equal to 32 weeks.

Figure 1: Shows out of the 60 babies, 17 developed retinopathy of prematurity (ROP). So the prevalence of ROP in our study was 28%.

Figure 2: Shows 8 (47.06%) subjects out of 17 were having stage II ROP, 5 (29.31%) subjects with stage I ROP, 3(17.65%) subjects had stage III ROP,1 (6%) subject had stage IV ROP and no subject had stage V ROP.

Maximum number of subjects i.e 12 (70%) had ROP in zone III, 4 (24%) subjects had ROP in zone II whereas 1 (6%) subjects had ROP in zone I.

Table 1 : Shows a table in which 100% babies diagnosed with ROP in this study had been subjected to oxygen supplementation which signifies the importance of oxygen supplementation as a risk factor for ROP.

Table 2 : Shows that out of the 17 ROP positive babies, 8 (47%) babies had developed sepsis whereas 9 (53%) babies did not develop sepsis.

Table 3 : Shows that out of the 17 ROP positive babies, 13 (76%) babies had history of RDS whereas only 4 (24%) babies did not have history of RDS showing a very high positive co-relation between ROP and RDS.

Table 4 : Shows that out of the 17 ROP positive babies, 14 (82%) babies had history of blood transfusion whereas only 3 (18%) babies did not have history of blood transfusions showing a very high association between ROP and blood transfusion.

**Table 1:** Co-relation between ROP an oxygen supplementation

ROP / O <sub>2</sub> Supply	Present	Absent	Total
No	0	33	33
Yes	17	10	27
Total	17	43	60

## 4. Discussion

In our study we enrolled 60 babies who were delivered before 32 weeks of gestation and had birth weight of less

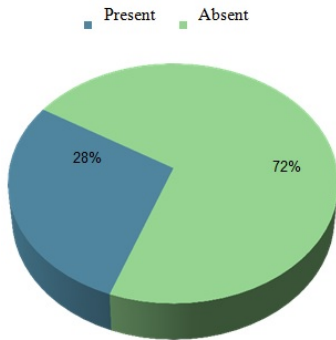


Fig. 1: Prevalence of ROP in study subjects

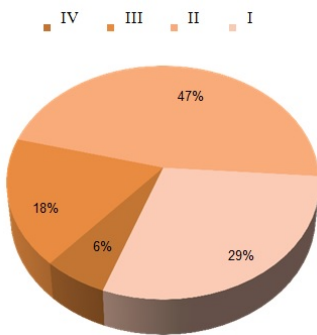


Fig. 2: Staging in ROP positive babies

Table 2: Co-relation between ROP and sepsis

ROP / H/O sepsis	Present	Absent	Total
No	9	42	51
Yes	8	1	9
Total	17	43	60

Table 3: Co-relation between ROP and RDS

ROP / H/O RDS	Present	Absent	Total
No	4	29	33
Yes	13	14	27
Total	17	43	60

Table 4: Co-relation between ROP and Blood transfusion

ROP / H/O Transfusion	Present	Absent	Total
No	3	28	31
Yes	14	15	29
Total	17	43	60

than 1500 gms. They also received oxygen supplementation. We also studied the risk factors associated with this disease seen in these babies. In our study, the prevalence of retinopathy of prematurity was 17 (28%).

This was in concurrence with study by Manohar et al.,<sup>13</sup> conducted at Pune, where the incidence was 19.9% and study by Gupta et al.,<sup>14</sup> of 60 babies, found incidence of ROP at 21.7%. In a study done by Anudeep et al., out of the 65 preterm babies screened, 24 (37%) developed ROP.<sup>15</sup>

Maximum number of babies i.e 12 (70%) had ROP in zone III, 4 (24%) babies had ROP in zone II whereas 1 (6%) baby had ROP in zone I. 5 (29%) babies were having stage I ROP, 8 (47%) babies out of 17 were having stage II ROP, 3(18%) babies had stage III ROP.1 (6%) baby had stage IV ROP and no babies had stage V ROP.

Our finding was similar to a study done by Crystal Le in which ROP was most commonly seen in Zone III (68%) and Zone II was the second most common (26%).<sup>16</sup> In a study done by Anudeep et al, 30% had stage 1, 37% had stage 2, and 33% had stage 3.<sup>15</sup>

Mean birth weight of babies in the study group was 1.36 ± 0.12 kgs. The highest birth weight was 1.5 kg and lowest was 1.1 kg.

This was similar to a study done by Jothi et al.,<sup>17</sup> in which 259 patients were examined and mean weight was 1.49 kgs. Another similar study was done by Sahu et al.,<sup>18</sup> where 240 babies were examined and mean weight was 1.45 kgs.

In our study we also noticed a positive association between ROP and oxygen supplementation. 27 (45%) babies out of 60 were given oxygen supplementation. Out of the 27 babies, 17 (63%) developed ROP showing a positive association between oxygen supplementation and ROP.

This was similarly seen in study done by Abdel et al.,<sup>19</sup> in which 172 infants were screened and there was positive association between ROP and oxygen supplementation (p value= 0.018).In the study done by Ratra et al.,<sup>20</sup> there was significant association between ROP and oxygen supplementation (p value = 0.001). In a study by Ved Gupta et al.,<sup>14</sup> in their centre, Oxygen (p=0.01) was an independent risk factor.

45 (75%) mothers were delivered by mode of normal vaginal delivery while 15 (25%) by lower segment caesarean section (LSCS). Out of the 17 babies with ROP, 12 (71%) were

delivered by normal vaginal delivery whereas only 5 (29%) were delivered by LSCS.

This was in concurrence with the study done by Manzoni et al.,<sup>21</sup> in which 174 babies were screened out of which 46 babies had ROP. Out of these ROP positive babies, 41% babies were born by normal vaginal delivery and 18% were born by LSCS and in the study done by Sahu et al.,<sup>22</sup> 240 babies were examined out of which maximum babies i.e. 72% were delivered vaginally and 28% through LSCS.

9 (15%) babies were having family history of retinopathy of prematurity (ROP), i.e history of ROP was present in siblings out of the 60 study subjects showing a positive association between family history and ROP. A larger study is needed to substantiate this association. Also, small subset of patient may have genetic predisposition to develop severe ROP due to abnormal Wnt gene signalling, or genetic polymorphisms, but this is still unclear.<sup>23</sup>

Only 9 (15%) babies out of 60 had sepsis. Out of which 8 (89%) babies had ROP showing a positive co-relation between sepsis and ROP. 27 (45%) babies out of 60 had associated respiratory distress syndrome (RDS). Out of 27, 13 (48%) babies had ROP, showing a positive correlation between ROP and respiratory distress syndrome (RDS). 29 (48%) babies out of 60, had history of associated blood transfusion. Out of 29, 14 (48%) babies had ROP, showing positive association with blood transfusion.

Gupta et al.,<sup>14</sup> in their study of 60 patients, found significant association of ROP with high oxygen requirement, sepsis, apnea, RDS and low birth weight. Similar significant association between ROP and RDS, exchange transfusion in children more than 1250gms was reported by Vinekar et al.,<sup>24</sup> Rekha et al.<sup>25</sup>, concluded that age less than 32 weeks, anaemia, apnea, transfusions and oxygen exposure were important risk factors for ROP.

## 5. Conclusion

We study also found a significant association between family history of ROP and the enrolled patients developing ROP. However, this association needs to be studied further with larger multicentre studies which may throw light on some genetic predisposition.

There was no association in our study between gender, mode of delivery and hyperbilirubinemia with ROP. ROP is a very important and preventable cause of blindness in childhood. Screening for early identification of retinal damage done soon after birth by an ophthalmologist is important to prevent this blindness. As observed screening guidelines and protocols are lacking in developing nations like India. The burden of this disease is bound to raise due to increased advances in the field of neonatology if screening protocols are not implemented stringently.

In remote areas where specialists are not available more outreach programmes should be held to facilitate screening process. Telemedicine is coming up in a major way and a lot of studies are also being conducted to test its effectiveness in picking up cases of ROP in remote places and referring them to higher centres for management. The introduction of Retcam-assisted screening in developing economies facilitates screening and follow-up of the rural population and remote places where availability of an ophthalmologist is difficult. Team work by ophthalmologists, paediatricians and obstetricians is essential to prevent blindness due to ROP.

## 6. Source of Funding

None.

## 7. Conflict of Interest

None.

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