

## RED REFLEX-SIMPLE YET EFFECTIVE SCREENING TOOL IN THE NEWBORN: A CROSS-SECTIONAL STUDY.

<sup>1</sup>Rutayani Dash\*, <sup>2</sup>Satyaranjan Mohapatra, <sup>3</sup>Jitendra Panda, <sup>1</sup>Radhakanta Bhoi.

<sup>1</sup>Assistant Professor, Department of Ophthalmology, MKCG MCH, Berhampur, Odisha, India.

<sup>2</sup>Assistant Professor, Department of ENT, MKCG MCH, Berhampur, Odisha, India.

<sup>3</sup>Assistant Professor, Department of Ophthalmology, SCB MCH, Cuttack, Odisha, India.

### Abstract

#### Background

The red reflex is practically easy to execute, non-intrusive, needs a minimum instrument, and identifies various ocular disorders. Red reflex examination in the infant is advised for the early diagnosis and management of ocular abnormalities. The prime goal of this research is to examine the outcome of the red reflex test in infants.

#### Materials and Methods

A retrospective cross-sectional research was carried out in which 100 newborn babies were included for one year. All the detailed history of the patients was recorded. The test was carried out in a dark room with the new baby on the lap of the parent. Notably, dilation was performed selectively: only infants with a history of ocular abnormalities underwent pupil dilation using 0.8% tropicamide with 2.5% phenylephrine before the examination.

#### Results

56 newborn babies were male and 44 newborn babies were female. 68 patients had normal vaginal delivery and 32 patients had C-sections. 24 children had red reflex, 14 children had Orange red reflex, 52 children had orange reflex, 8 children had grayish white reflex and 2 children had black shadow reflex.

#### Conclusion

In the present research it was concluded that the red reflex test has great precision and, therefore helps in diagnosing ocular disorders in newborn babies. It is observed that the red reflex is the less time-consuming and economical procedure for detecting ocular defects. The red reflex test is an easy-to-perform and secure method for the examination of the eyes.

#### Recommendation

Newborns should receive a red reflex test before leaving the medical center. Normal results indicate consistent color, intensity, and transparency in both eyes. Abnormal results warrant referral to an ophthalmologist for early diagnosis and prevention of visual disabilities.

**Keywords:** Red reflex, Newborn, Ocular pathology

**Submitted:** 2024-03-26 **Accepted:** 2024-03-28

**Corresponding author:** Rutayani Dash\*

**Email:** rutayanidash@gmail.com

**Assistant Professor, Department of Ophthalmology, MKCG MCH, Berhampur, Odisha, India.**

### Introduction

The red reflex evaluation be carried out in infants to diagnose and manage optical abnormalities promptly, and to stop ocular disability is recommended by the American Academy of Pediatrics [1,2]. The detection and management of cataracts present from birth is the prime concern of the World Health Organization [3]. Cataracts present from birth that are not treated are accountable for around 9% of children's visual impairment worldwide [4]. According to research, 70 % of patients with visual impairment are avoidable, which suggests a development in the standard of

living. In comparison to adult cataracts where the operation can be held up, it cannot affect the optical result, but early treatment of cataracts in children is important to achieve the maximum optical potentiality.

If the operation was not done on time for cataracts from birth may lead to impaired optical growth with unrepairable amblyopic. For prompt diagnosis of ocular disorders and quick management comprehensive health examinations utilizing the red test are carried out in various nations, leading to the timely detection of many optical abnormalities including cataracts, and retinal

disorders also [1, 2]. Red reflex occurs through leukocoria, the prime indication which is a disorder pupil is white color, frequently observed in cataracts from birth [5]. The significance of the red reflex is to examine the standard clear medium of the optics. The eye surgeon examines the inner anatomy by fundoscopy. The color of the reflexive evaluated can be affected by many elements like frequency of light, complexion, and phase of retinal growth. Bruckner reported a technique to examine the uniformity of pupil reflex which is called the red reflex [6]. Even though the red reflex examination is suggested broadly for the diagnosis of new baby optical abnormalities [7, 8], the moderate occurrence of notable optical abnormalities makes the evaluation test tough. Much research supports the significance of this test for the diagnosis of cataracts from the time of birth [9-11], irrespective of the moderate occurrence of cataracts in new babies. The evaluation can be carried out by a surgeon or a nurse after the completion of a certified course in the UK [12]. According to many studies, the procedure of red reflex is simple and needs moderate time of teaching [13-15]. Complete recommendations for age group and risk grouping child optical examination are given [16]. From this perspective, the benefit of this test as an easy and low-cost extensive infant examination method can't be compromised. The red reflex test was carried out in a dark space and an ophthalmoscope was held near the patient's eye. Light has to be cast on both the optics of the patient at once around 17 inches away from the patient and motivating patients to see directly to the light. This test is preferably carried out when the pupil is not dilated. Radiant and aligned red reflex and the same dimension of the pupil is normal. In squinting the red reflex is strong in the diverged optic. The reflex is unclear, like a white reflex in a cataract. Red reflex examination in the infant is advised for the early diagnosis and management of ocular abnormalities. The prime goal of this research is to examine the outcome of the red reflex test in infants.

## Materials and Methods

### Study design

A retrospective cross-sectional study.

### Study setting

The research was done in MKCG MCH, Berhampur, Odisha, India Hospital, spanning from March 2023 to April 2024.

### Study population and size

The research included 100 newborn babies.

### Inclusion criteria

New babies and their parents who gave consent.

### Exclusion criteria

Babies who are seriously ill.

### Sample size

To calculate the sample size for this study, the following formula was used for estimating a proportion of a population:

$$n = \frac{Z^2 \times p \times (1-p)}{E^2}$$

Where:

- n = sample size
- Z = Z-score corresponding to the desired level of confidence
- p = estimated proportion in the population
- E = margin of error

### Data collection

All the detailed histories of the patients were recorded. The test was carried out in a darkened room with the new baby on the lap of the parent. The dilation of the optics was done with 0.8% tropicamide, in addition to 2.5% phenylephrine. Once the dilation was fully attained ophthalmoscopy was done.



**Figure 1: greyish white reflex in ROP**



**Figure 2: White reflex in Endophthalmitis**

### **Bias**

There was a possibility that bias may have occurred during the beginning of the research but was circumvented by providing all patients with similar details and keeping the confidentiality of the category allotment from the staff who gathered the details.

### **Ethical consideration**

The aim of the research was demonstrated. Consent was taken from all the research subjects. The privacy of the subjects was kept.

### **Ethical approval**

This research was sanctioned by the ethical council of the institution.

### **Statistical analysis**

Statistical package for social sciences version 21.0 statistical analysis software was utilized for the statistical evaluation. The categorical data was described as prevalence and percentage. For theoretical data, the chi-square test or Fisher exact test was utilized. Determinable data was evaluated by a T-test.

## Results

**Table 1: Classification according to the gender of the child**

Gender	Number of children
Male	56
Female	44

As shown in Table 1, 56 newborn babies were male and 44 newborn babies were female.

**Table 2: Classification as per the method of delivery**

Method of delivery	Number of patients
Normal vaginal delivery	68
C - section	32

In Table 2, 68 patients had a normal vaginal delivery and 32 patients had C-sections.

**Table 3: Classification according to the color of the reflex**

Color of the reflex	Number of children
Red reflex	24
O.red	14
Orange	52
Grayish white	8
Black shadow	2

As shown in Table 3, classification was done based on the color of the reflex. 24 children had red reflex, 14 children had O.red reflex, 52 children had orange reflex, 8 children had grayish white reflex and 2 children had black shadow reflex.

**Table 4: Classification as per the differentiation of color of each optics**

Reflex color	Number of children
Same	69
Dissimilarity in intensity	31

As shown in Table 4, 69 children had similar red reflexes on both optics, and 31 children the red reflex had dissimilarity in intensity in both the optics.

## Discussion

The study on red reflex as a screening tool in newborns categorized the data according to gender, method of delivery, color of the reflex, and differentiation of color in each optic. Of the total newborns, 56 were male and 44 were female. 68 newborns were delivered vaginally, while 32 were delivered via C-section. When assessing the color of the reflex, 24 newborns had a red reflex, 14 had an off-red reflex, 52 had an orange reflex, 8 had a grayish-white reflex, and 2 had a black shadow reflex. Additionally, 69 newborns had a consistent red reflex in both optics, while 31 had a difference in intensity between the two optics. These findings suggest variability in reflex color and consistency,

emphasizing the importance of thorough screening to detect potential abnormalities early in newborns.

Buckner in 1962 first introduced the utilization of the red reflex test for physical examination method [6]. The light has to move past a transparent uncolored optical medium for the creation of a red reflex. From this perspective, the benefit of this test as an easy and low-cost extensive infant examination method can't be compromised. The standard outcome of the test needed clearness of all the components. The outer covering of the retina creates the red reflex. Even though Bruckner initially reported the standard reflex as red it can also be orange, yellow, or red. The atypical test shows a lack of reflex, incoherence, white reflection from the cornea, and no homogeneity of reflex. The abnormality of the test occurs when there is an injury on the optic nerve, cataract, bleeding inside the eye, retinal growth, and ocular disorders.

Even though the red reflex test is regarded as an easy analysis, but needs attentiveness at the time of its comprehension, since the analyst is required to check the reflex features precisely. Further major details while carrying out this test is the understanding of the tester about the anatomy of the optical and the evaluation of understanding of components associated with the mother and the newborn baby who will help to find out the change in eyesight of the baby and the result of the red reflex test. In research carried out in 2002 in which 662 new babies were included for the examination, carried out in dark rooms, utilizing red reflex was observed that the chief optical change seen in the test was corneal opaqueness [16]. The field of vision should be transparent, that is optical medium should be clear without any opaqueness like a black dot which stops the red reflex [17]. Commonly the fundus of a newborn baby seems light because the blood vessels are not fully grown which gives pigmentation to the eye. Therefore, yellow or white color is seen in the ophthalmoscope.

In every research, the detection of every newborn baby with the red reflex test was defined except for one [18]. The detecting capability of the red reflex test for the anterior part of the optics is more adequate than the posterior part of the oculus. Therefore, the red reflex test is better for the examination of the front part of the oculus than the posterior part. Sometimes, some doctors observe that RRT can be made easier by the dilation of the optics of the child. Many substitutes are used for the dilation of the eyes which causes complications in the future. It causes tachycardia, an increase in heartbeat, abnormal heartbeat, and eczema. Nevertheless, dilation of the pupil is carried out by doctors regularly with the least reports of complications. Therefore, this is a secure procedure to carry out in babies. Finer and more economical examination methods are coming out as a possible substitute for the conventional red reflex test. It was observed that RRT is an easy procedure that needs less time and fewer instruments. In a study, it was seen that the children with less pigmentation in optics had a reflex of orange color while in children with a lot of pigmentation in optics, the reflex is darker in color [19].

In preterm babies, the remains of tunica vasculosa lenses are frequently seen in the anterior or posterior part. The remains generally resolve gradually, but hardly remain behind and look like cobwebs [20]. Babies who are born before the term with very little body mass can be affected by retinopathy of prematurity which can lead to loss of vision in the newborn baby. Notably, a premature baby is more prone to change in eyesight than a baby born after a full term. Therefore, the most likely impact of fetal age and weight decides the color of the reflex.

### **Generalizability**

The findings of the study can be applied to a larger population by replicating the research with a broader sample size across diverse demographics and regions. Collaboration with multiple centers allows for the integration of red reflex screening into routine newborn care, providing training for healthcare professionals, and educating parents. Monitoring outcomes ensures effectiveness, enabling adjustments to protocols as needed for improved newborn healthcare.

### **Conclusion**

In the present research, it was concluded that the red reflex test has great precision and, therefore helps in diagnosing ocular disorders in newborn babies. It is observed that the red reflex is the less time-consuming and economical procedure for detecting ocular defects. The red reflex test is an easy-to-perform and secure method for the examination of the eyes. And this test needs very little instrumentation.

### **Limitations**

The restraints of the current study involve a smaller number of patients associated with this analysis. The observation of the current research cannot be extrapolated for a larger number of people. Additionally, the lack of the combined category also acts as a limitation of this study's findings.

### **Recommendation**

Every newborn baby should undergo a red reflex test for the optics carried out by doctors before discharging from the medical center. The outcome of the test should be termed normal if the color, intensity, and transparency of both the eyes are same. Newborn babies with abnormalities in reflex tests should be referred to a child specialist. The examination should be done if the baby's parents had a history of leukocoria.

### **Acknowledgment**

We are very thankful to the staff and hospital of the Department of Pediatrics, and Department of Gynecology at MKCG MCH for carrying out this research.

### **List of Abbreviation**

RRT: Red reflex test

### **Conflict of interest**

There was no difference of opinion.

### **Funding**


No funding was provided for this research.

## References

1. Pediatrics of Association American, Pediatrics of Academy American and, Strabismus and of y adults young and, children, infants in examination Eye.
2. American Academy of Pediatrics, Pediatrics of Academy Ophthalmology by adults young and, children, infants in examination Eye. Ophthalmology health child the define and guide to principles organizational: pediatricians;2003 Ophthalmology. children all of the health the improve or/and system care .5-860: 110.
3. WHO avoidance of elimination for the initiative Global. Blindness
4. Ophthalmol Surv. cataracts Infantile. AV Drack, SR Lambert. 5. 7: 40; 1996
5. Sociedade Cagini C, Tosi G, Stracci F et al. Red reflex examination in neonates: evaluation of 3 years of screening. *Int Ophthalmol* 2017; 37: 1199-1204
6. Cearense de Pediatria. Saúde da criança - teste do olhinho precisa ser lei. Boletim Informativo da Sociedade Cearense de Pediatria [Internet]. 2009.
7. Brückner and the red reflex. Roe LD, Guyton DL. The light that leaks: *Surv Ophthalmol* 1984; 28: 665-670.
8. Eventov-Friedman S, Leiba H, Flidel-Rimon O, et al. The red reflex examination in neonates: an efficient tool for early diagnosis of congenital ocular diseases. *Isr Med Assoc J* 2010; 12: 259-261
9. Ruttum MS, Nelson DB, Wamser MJ et al. Detection of congenital cataracts and other ocular media opacities. *Pediatrics* 1987; 79: 814-817
10. Magnusson G, Bizjajeva S, Haargaard B et al. Congenital cataract screening in maternity wards is effective: evaluation of the Paediatric C cataract R register of S Sweden. *Acta Paediatr* 2013; 102: 263-267.
11. Khokhar S, Pillay G, Agarwal E. Pediatric cataract—the importance of early detection and management. *Indian J Pediatr* 2018; 85: 209-216
12. Newborn and Infant Physical Examination Screening Program Handbook In England PH ed: Crown 2018.
13. Fry M, Wilson GA. Scope for improving congenital cataract blindness prevention by screening of infants (red reflex screening) in a New Zealand setting. *J Paediatr Child Health* 2005; 41: 344-346.
14. Saiju R, Yun S, Yoon P et al. Bruckner red light reflex test in a hospital setting. *Kathmandu Univ Med J* 2012; 11: 23-26.
15. Ventura G, Cozzi G. Red reflex examination for retinoblastoma. *The Lancet* 2012; 380: 803.
16. Honavar SG. Pediatric eye screening - Why, when, and how. *Indian J Ophthalmol* 2018;66:889-92
17. Wasilewski D, Zago RJ, Bardal AMC, Heusi, TM, Carvalho FP, Maciel LF, et al. Importância da avaliação oftalmológica em recém-natos. *J Pediatr.* 2002;78(3):209-12
18. Jarvis C. Exame físico e avaliação de saúde. 3ed. Rio de Janeiro: Guanabara Koogan; 2002.
19. Tamura MY, Teixeira LF. Leucocoria e Teste do Reflexo Vermelho. *Einstein.* 2009; 7(3):376-82
20. Voughan D, Asbury T, Riordan-Eva P. *Oftalmologia geral.* 15ed. São Paulo: Atheneu;2003.

**Publisher details:**

**SJC PUBLISHERS COMPANY LIMITED**



The logo is a circular emblem with a dark red background. On the left side, there is a white icon of a house with a chimney. To the right of the icon, the text "SJC Publishers Company Limited" is written in white, stacked vertically. Below the company name, the tagline "TRUST AND INTEGRITY" is written in a smaller font.

Category: Non-Government & Non-profit Organisation  
Contact: +256775434261(WhatsApp)  
Email: [admin@sjpublisher.org](mailto:admin@sjpublisher.org), [info@sjpublisher.org](mailto:info@sjpublisher.org) or [studentsjournal2020@gmail.com](mailto:studentsjournal2020@gmail.com)  
Website: <https://sjpublisher.org>  
Location: Wisdom Centre Annex, P.O. BOX. 113407 Wakiso, Uganda, East Africa.