



ORIGINAL RESEARCH PAPER

Ophthalmology

“AETIOLOGY OF LEUKOCORIA IN YOUNG PATIENTS ATTENDING TERTIARY CARE CENTRE - A CROSS-SECTIONAL STUDY”

KEY WORDS:

Dr. Sadhana Dubey*

PG Final Year, Dept. Of Ophthalmology, PT.JNM Medical College, Raipur, C.G. *Corresponding Author

Dr. Swati Kujur

M.S. Ophthalmology Associate Professor, Dept. Of Ophthalmology, PT.JNM Medical College, Raipur, C.G.

Dr. Jayshree Salam

M.S. Ophthalmology Associate Professor, Dept. Of Ophthalmology, PT.JNM Medical College, Raipur, C.G.

Dr. Nidhi Pandey

M.S. Ophthalmology Head Of The Department, Dept. Of Ophthalmology, PT.JNM Medical College, Raipur, C.G.

ABSTRACT

Context: Leukocoria is defined as an abnormal pupillary light reflection that usually results from an intraocular abnormality and is seen most often in children. The purpose of this study is to identify the common causes leading to white pupillary reflex in the tertiary care centre, and once found, that will help in timely intervention to minimize morbidity and mortality. **Aim:** To study the aetiology of leukocoria in young patients attending tertiary care centres. **Settings and Design:** It was a Cross-sectional observational study conducted in the Department of Ophthalmology, Pt. J.N.M. Medical College, Raipur from October 2021 to December 2022 **Methods and Material:** 60 Patients up to 30 years, with the complaint of white pupillary reflex coming to the Department of Ophthalmology, Dr. BRAMH Raipur, during the study duration and willing to participate in the study were included in the study. Interviews and examinations of all patients were done which included BCVA, Slit Lamp Examination, Fundus Examination, Ancillary tests, and imaging. Patient with any corneal pathology and Previous history of ocular surgery. **Statistical Analysis Used:** The convenience sampling method was used. **Results:** In our study, 90 % of the patients presenting with leukocoria had cataracts. 5 % of patients had PHPV with RD, 1.6% with Absolute glaucoma with RD, 1.6% with Retinoblastoma, and 1.6% with total RD. Among Cataract, the most common cause was congenital/developmental cataract comprising 79.6% of total patients presenting with cataract with most of the population present in the 0-5 years of age group. 15% had Traumatic cataract, 1.8% with metabolic cataract and 1.8% with complicated cataract. In patients diagnosed with traumatic cataract, there was a significant male predominance presenting 90% of the traumatic cataract population. **Conclusions:** Leukocoria is a crucial finding that requires early attention and prompt diagnosis of the underlying disease. A thorough examination is required as a delay in diagnosing the etiology can result in eyesight loss, death, or both.

INTRODUCTION:

Leukos: white, Kore: pupil. Leukocoria is defined as an abnormal pupillary light reflection that usually results from an intraocular abnormality and is seen most often in children. The normal red reflex of the human eye is due to the retro-illumination of normal choroidal vasculature reflecting through the retina, vitreous, lens, pupil, and cornea. Any interference in any of these structures would give an altered red reflex or Leukocoria^[1]

It is found in abnormalities of the lens (e.g., cataract), vitreous (e.g., old resolving hemorrhage), or retina (e.g., retinoblastoma), etc. Leukocoria in infants is always a danger signal, members of the immediate family circle are most likely to notice the first sign, and the general practitioner, pediatrician, or general ophthalmologist are first to be consulted^[2] The variety and scope of these various eye problems underscore the importance of discovering a white pupil in an infant. Various diseases with very different pathologies can lead to white pupillary reflex in children. Consequences may be disastrous because by the time eye alterations are found, the child may have developed a permanent loss of visual acuity. Leukocoria demands immediate attention as it may not only endanger the patient's vision but also his/her life, depending on the lesion.^[3]

The major causative factors, which lead to leukocoria, are congenital cataract (60%), retinoblastoma (18%), retinal detachment (4.2%), persistent hyperplastic primary vitreous (PHPV) (4.2%), and Coat's disease (4.2%)^[4]. Pediatric cataract can be congenital or acquired, unilateral or bilateral [18], and curable in most cases. Pediatric cataract is one of the most common causes (for 5–20% of pediatric blindness worldwide^[5]) of blindness and severe vision impairment in children,

despite their rarity^[6]. Globally, 200 000 children are blind due to cataracts, with 20,000–40 000 children born with congenital cataract each year^[7]. The presence of leukocoria, a white pupil or altered red-reflex test especially in children, is relevant ophthalmological evidence deserving prompt diagnosis and treatment when necessary.

This study underlines the importance of the red reflex test in young adults and presents the main causes of leukocoria (cataract, retinoblastoma, and retinal and vitreous diseases) to alert pediatrician, neonatologists, and ophthalmologist about this condition. Immediate referral to an ophthalmologist, an interdisciplinary liaison with a pediatric ophthalmologist, retina specialist, and ocular oncologist will help in the management of eyes with leukocoria in an appropriate manner. The purpose of this study is to identify the common causes leading to white pupillary reflex in tertiary care centre, and once found, that will help in timely intervention to minimize morbidity and mortality.

SUBJECTS AND METHODS:

It was a Cross-sectional observational study conducted in Department of Ophthalmology, Pt. J.N.M. Medical college & Dr. B.R.A.M. Hospital Raipur, Chhattisgarh from December 2021 – December 2022. Patients up to 30yrs of age with white reflex coming to DR. BRAMH, RAIPUR and willing for the study were included in the study. Patients up to 30 years of age with any corneal pathology (leucomatous opacity) and previous history of ocular surgery were excluded .60 Patients were chosen according to inclusion and exclusion criteria. Valid Informed written consent was obtained from the patient and the patient 's guardian. Patient data was recorded, and a Performa was made to collect all the necessary information. Detailed History was taken including the age of onset of

leukocoria / the age at which the parents noticed leukocoria and duration of abnormal white reflex. Proper history regarding the history of retinopathy of prematurity and Trauma was asked. Relevant Medical History included history of prematurity, Prenatal infections, Birth trauma, Exposure to pets, Presence of skin lesions, Arthritis and Other systemic diseases like Tuberculosis (associated with retinal astrocytomas), endogenous endophthalmitis. History of similar complaints in parents and siblings along with detailed birth history regarding birth weight, Maternal Infection, Oxygen therapy & immunization was asked. Snellen's chart was used to document the visual acuity in verbal children and literate adults. In preverbal children, Teller visual acuity measurements were done.

- a) Simple picture chart: used for children > 2 years
- b) Landolt's C-chart: used for illiterate patients
- c) E-chart: used for illiterate patients

Complete ophthalmic examination of the anterior segment using torchlight and slit-lamp examination. Detailed posterior segment using Indirect ophthalmoscope or 90D lens with a slit lamp under the mydriatic effect of Tropicamide + Phenylephrine eye drops was done. B-Scan was done in all the cases. If needed X-Ray orbit, CT scan, OCT & MRI Orbit was done to confirm the diagnosis.

RESULTS:

In this study, 60 patients were enrolled. Majority of the patients (70%, n = 21) belonged to the age group of 0-10 years of age. The youngest patient was 3 months old, and the oldest patient was 24 years. In this study, there was a slight male preponderance, which was 57% of patients and female 43%. Majority of the male were in 6-10 years age group. In 0-5 year, age-group, female population surpass the male population. In remaining all other groups, male population was greater than female population. (Figure 1) In our study, majority of the population presenting with leukocoria were from rural area comprising 85% of the total population and rest 15% belonged to the urban area. Majority of patients with leukocoria in our study belong to lower socio-economic status (65%), followed by middle (26.7%) and high socio-economic status (8.3%). (Table 1)

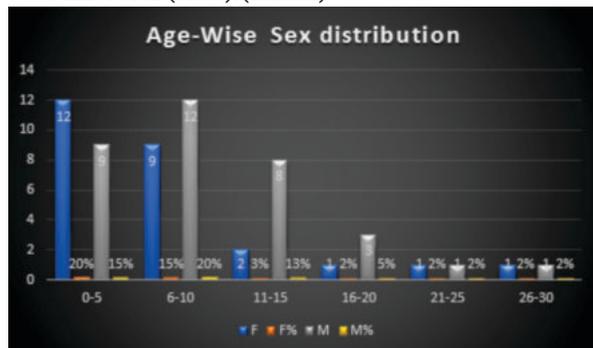


Figure 1- Clustered column showing age-wise sex distribution.

Table 1 – Demographic profile of patients included in the study.

Sno	Characteristics	Frequency (n)	Percentage %
1	Age		
	0-5 years	21	35
	6-10 years	21	35
	11-15 years	10	16.67
	16-20 years	4	6.67
	21-25 years	2	3.33
	26-30 years	2	3.33
2	Gender		
	Male	34	57
	Female	26	43

3	Geographical Distribution		
	Rural	51	85
	Urban	9	15
4	Socioeconomic Status		
	High	5	8.30
	Low	39	65
	Middle	16	26.70
	Total	60	100

In our study 90 % of the patients presenting with leukocoria had cataract. 5 % patients had PHPV with RD, 1.6% with Absolute glaucoma with RD, 1.6% with Retinoblastoma, 1.6% with total RD. (Table 2)

Table 2 -Causes of Leukocoria

Disease	Frequency(n)	Percentage (%)
Absolute Glaucoma +RD	1	1.6
Cataract	54	90
PHPV With RD	3	5
Retinoblastoma	1	1.6
Total RD	1	1.6
Grand Total	60	

Most patients with cataract belong to the age group of 0 to 10 years. The patients with PPHV with RD, Retinoblastoma and total RD were also found mostly among patients below 10 years of age although absolute glaucoma with RD was found in 26 to 30 years age group. Among Cataract, most common cause was congenital/developmental cataract comprising 79.6% of total patients presenting with cataract with majority of population present in 0-5 years of age-group. 15% had Traumatic cataract, 1.8% with metabolic cataract and 1.8% with complicated cataract. In patients diagnosed with traumatic cataract, there was a significant male predominance presenting 90% of the traumatic cataract population. (Table 3, Figure 2)

Table 3 - Age wise distribution of causes of leukocoria

Disease	0-5	6-10	11-15	16-20	21-25	26-30	Grand Total
Absolute Glaucoma +RD						1	1
Cataract	19	18	10	4	2	1	54
PHPV With RD	2	1					3
Retinoblastoma		1					1
Total RD		1					1
Grand Total	21	21	10	4	2	2	60

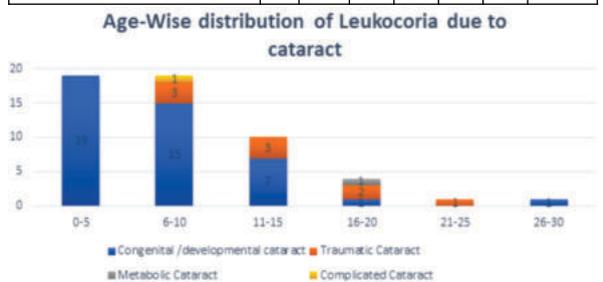


Figure 2 - Stacked column showing age-wise distribution of leukocoria due to cataract

Table 4- Clinical profile of patient

Sno	Clinical profile	Frequency(n)	Percentage%
1	Laterality		
	Bilateral	35	58.3
	Unilateral	25	41.7
	Right	11	44
	Left	14	56
2	Age at Onset		
	0-5	41	68.33
	6-10	10	16.67
	11-15	4	6.67
	16-20	2	3.33

	21-25	1	1.67
	26-30	2	3.33
3	History of Oxygen therapy	9	15
4	Positive family history	9	15

In this study, leukocoria in most of the patients was bilateral (58.3%). Left eye was affected more common than the right eye which constitutes 56% of the total unilateral cases. Majority of the study population presented within 5 years of onset of leukocoria comprising 68.3% of total population. 15% of the study population had history of oxygen therapy after birth. Out of these, 1 had Retinopathy of Prematurity. In our study, 21% patients diagnosed with congenital/developmental cataract had positive family history. Among these 78% were male and 22% were female.

DISCUSSION:

This study is a cross-sectional observational study which was carried out in Dr. BRAMH, Raipur from December 2021 to December 2022. This study aims at finding out the different aetiological factors of Leukocoria in patients coming to the tertiary care centre in Raipur.

Table no.-1 shows, 70% of the patients with leukocoria in our study belong to 0-10 yrs of age group. Diagne JP^[8] (2017) observed that Leukocoria represented one of the ten reasons for consultation among children under 10 years of age. The mean age in our study was 99.5 months which was higher than of Batra et al.^[9] and Haider et al.^[10] who find respectively 31.1 months and 51.24 months as the age group included in our study is greater than those studies.

Table no.-2 shows 90 % of the patients presenting with leukocoria in our study had cataract which was higher than mentioned in the previous studies. Rizwana D et al.^[11] found that cataract was 77.3%, retinoblastoma 5.8%, retinal detachment 4.1%, persistent hyperplastic primary vitreous (PHPV) 8.1%, and Coats disease was 4.7% in children with white pupillary reflex. M. Israr et al.^[12] found out that the common cause of aberrant pupillary reflex in children aged 1 to 10 years was cataract, 79.76 percent of patients having it. Retinoblastoma (12.5%), Coats disease (3.5%), retinal detachment (2.9%) and persistent hyperplastic primary vitreous (PHPV) (1.1%). Our study was similar to these studies in the context that the most common cause came out to be cataract in all these studies. In our study most of the patients were pediatric cataract belonging to the age group 0-10 yrs, similar to the above-mentioned studies. Frequency of RD (8.2%) was more than Retinoblastoma (1.6%) in our study which differ from the above-mentioned studies. One of the main reasons behind the difference between the previous study result and our study finding could be the Lack of education and awareness among the parents in our state regarding white pupillary reflex. In our setup, majority of the patients with retinoblastoma presents with mass rather than leukocoria i.e., at the end -stage of the disease and there is increase mortality related to retinoblastoma. In addition to this PHPV percentage was higher in our study than the above-mentioned studies.

Table no.-3 shows among the 90% of the population diagnosed with the cataract, congenital/developmental cataract was present in 79.6% population. This finding was similar to that found in the study conducted by M. Israr et al.^[12] i.e., 79.76% in 2017 and Rizwana D et al.^[13] (77.3%) in 2008 and was higher than the findings of Syed et al.^[10] (60%) study carried out in 2000. In terms of human morbidity, economic loss, and societal hardship, blindness in children, due to cataract, is a considerable concern in poor countries^[8]. The reason for this finding is that congenital/developmental cataract is more common in poor and developing countries like India because of the nutritional deficiency among mother and children, negligence in case of positive family history, more complications during and post-delivery, Low Birth and O2 supplementation. Ophthalmic assistants play a major role

in creating awareness about white pupillary reflex and congenital cataract in the peripheral centres and referring these patients to the tertiary centre. Pediatric cataract is one of the most common causes (for 5–20% of pediatric blindness worldwide^[13]) of blindness and severe vision impairment in children, despite its rarity^[12]

Frequency of traumatic cataract was 15% in our study which was on a lower side as compared to the study conducted by M. Eckstein et al.^[18] in South India in 1996 (29%). This finding could be due to the negligence and lack of awareness in our geographical area. Parents don't report to the hospital unless there is significant bleeding, pain, swelling and many more severe symptoms. They seek the treatment later in life when the visual acuity gets reduced significantly.

Table no.-4 shows out of 60 patients included in the study, 34 (57%) was male and 26 (43%) were female. In a study conducted by Syed Haider et al.^[10], 39 (55%) patients were boys, and 32 (45%) patients were girls. Another study conducted by Muhammad Israr et al.^[12] in 2021 in Peshawar, 113 (67.26%) were males, and 55 (32.73 %) were females. Girls are usually neglected, and they attend primary centres and parents don't want to go the higher centre even if advised to go to higher centre for further mm.

Table no -5 shows there was male predominance (90%) in our study with majority of male population lying in 6–10-year age-group. In 0–5-year, age-group, Female population surpasses the male population. No previous studies have mentioned Age and Gender distribution for Leukocoria.

Table no.- 6 shows 85% of the study population were from rural area and 15% were from urban area. In rural areas, there is lack of health services which is needed during and after pregnancy. There's no timely intervention for maternal infection, low birth weight, pre-term. ROP screening protocol is not followed properly due to which a prematurely born child can end up in Retinal detachment. Child born with Leukocoria or developing later in life is often neglected as there is lack of knowledge and exposure. There's a need of Time-to-time training at the PHC level about the National Blindness Prevention Programme

Table no.-7 shows among the patients presenting with traumatic cataract, 90% were male and 10% female. As boys are more involved in outdoor activities and quarrel, so there is increase prevalence of trauma among males. In addition to this, Females are most neglected ones and even if they want to report to the hospital, their family member refuses. This finding was similar to M. Eckstein et al (1996)^[14].

Table no.-8 shows that 21% patients diagnosed with congenital/developmental cataract had positive family history. Among these 78% were male and 22% were female. This finding was less than those found in the study conducted by Micheal Eckstein et al.^[14] (25%) in South India and more than those found in M G wirth et al^[15] (18.8%) in Australia.

Table no.-9 shows 15% of the study population had history of oxygen therapy after birth. 1 out of this had Retinopathy of Prematurity. 100% O2 therapy is given to pre-mature infants in some places where the health service providers are not aware about the recent guidelines.

Table no.-10 shows that majority of the study population presented within 5 years of onset of leukocoria comprising 68.3% of total population. The finding was more than those found by Rizwana et al.^[11] (51.7%) in 2016 and less than those found by M. Israr et al.^[12] (78.5%) in 2021.

Table no.-11 shows in 35 cases (58.3%) both the eyes were affected, in 14 cases (56%) left eye was affected and in 11 cases (18.3%) right eye was affected. This finding was

different from those found by Muhammad Israr et.al^[12] (2002) where in 84 cases (50%), the right eye was affected, in 63 cases (37.5%), the left eye, and in 21 (12.5%) cases, both eyes. There is no correlation between the laterality and causes of leukocoria. It can differ from place to place without any significance.

Table no.-12 shows that majority of patients with leukocoria in our study belong to lower socio-economic status (65%), followed by middle (26.7%) and high socio-economic status(8.3%). This finding was similar to those found by Ido Didi Fabian^[16] the most common indication for referral was leukocoria (n = 2638 [62.8%]), followed by strabismus (n = 429 [10.2%]) and proptosis (n = 309 [7.4%]). Patients from high-income countries (HICs) were diagnosed at a median age of 14.1 months, with 656 of 666 (98.5%) patients having intraocular retinoblastoma and 2 (0.3%) having metastasis. Patients from low-income countries were diagnosed at a median age of 30.5 months, with 256 of 521 (49.1%) having extraocular retinoblastoma and 94 of 498 (18.9%) having metastasis. Lower national income level was associated with older presentation age, higher proportion of locally advanced disease and distant metastasis, and smaller proportion of familial history of retinoblastoma.

REFERENCES:

1. Gitter KA, Meyer D, White RH, Ortolan G, Sarin LK (1968) Ultrasonic aid in evaluation of leukocoria. *Am J Ophthalmol* 65(2): 190-195.
2. T.Mattas S (1988) Leukocoria in infants and children. *Ophthalmologist Maxicare, inc. Future Reflection Fall, 7.*
3. Garber JE, Offit K, Hereditary cancer predisposition syndromes. *Journal of clinical oncology: official journal of the American Society of Clinical Oncology.* 2005 Jan 10.
4. BasuS, KumarA, KapoorK, BagriNK, Chandra A, Neonatal endogenous endophthalmitis: a report of six cases. *Pediatrics.* 2013 Apr.
5. Balmer A, Munier F. Diagnosis, and treatment of intraocular tumors in the child. *KlinMonblAugenheilkd.* 2001;218(5):292-297.
6. Balmer A, Munier F. Leukocoria in a child: emergency and challenge. *KlinMonblAugenheilkd.* 1999;214(5):332-335.
7. ChangL, BlainD, BertuzziS, BrooksBP. Uveal coloboma: clinical and basic science update. *Curr Opin Ophthalmol* 2006; 17:447-70.
8. Digne JP, Sow AS, Ka AM, Wane AM, Ndoye Roth PA, Ba EA, De Medeiros ME, Ndiaye JM, Diallo HM, Kane H, Sow S, Nguer M, Sy EM, Ndiaye PA. Les causes rares de leucocorie chez l'enfant [Rare causes of childhood leukocoria]. *J Fr Ophtalmol.* 2017 Oct;40(8):676-680. French. doi: 10.1016/j.jfo.2017.04.008.
9. Batra R, Rowe F, Rowlands A, Noonan C. Unilateral leucocoria in clinically normal eyes. *Br J Ophthalmol.* 2009 Apr;93(4):556-7. doi: 10.1136/bjo.2008.149864.
10. Haider S, Quershi, Ali A (2008) Leukocoria in children. *J Pediatric Ophthalmol Strabismus* 45(3): 179-180.
11. Rizwana D, Abdul H, Darikta DS, Muhammad FF. *Biostat Biometrics Open Acc J.* 2018; 4(3):555636
12. Israr M, Zahir KK, Khattak A, Khattak IU, Gul N. Etiology of white pupillary reflex in pediatric age group. *Rom J Ophthalmol.* 2022 Jan-Mar;66(1):32-35. doi: 10.22336/rjo.2022.8. PMID: 35531443.
13. Gilbert C, Foster A. Childhood blindness in the context of VISION 2020-the right to sight. *Bull World Health Organ.* 2001;79(3):227-232
14. Eckstein, Michael & Vijayalakshmi, P. & Gilbert, Clare & Foster, Allen. (1999). Randomised clinical trial of lensectomy versus lens aspiration and primary capsulotomy for children with bilateral cataract in south India. *The British journal of ophthalmology.* 83. 524-9. 10.1136/bjo.83.5.524.
15. Wirth, M & Russell-Eggitt, I & Craig, J & Elder, J & Mackey, David. (2002). Etiology of congenital and pediatric cataract in an Australian population. *The British journal of ophthalmology.* 86. 782-6. 10.1136/bjo.86.7.782.
16. Global Retinoblastoma Study Group, Fabian ID et.al Global Retinoblastoma Presentation and Analysis by National Income Level. *JAMA Oncol.* 2020 May 1;6(5):685-695. doi: 10.1001/jamaoncol.2019.6716. Erratum in: *JAMA Oncol.* 2020 Nov 1;6(11):1815. PMID: 32105305.