

A study of referral pattern to pediatric ophthalmology department in a tertiary eye-care center of South-India

Iva R Kalita, Veena K, Freidrick Mouttappa, Harsh V Singh¹

Purpose: The study was aimed at finding out the present pattern of referrals to the Pediatric Ophthalmology outpatient department (OPD) in a tertiary eye care hospital and thus identify the discrepancy of referral, if any, which would help to modify and enhance the practice guidelines. **Methods:** The study was conducted by retrospectively collecting data from all referral letters that were already uploaded in the Electronic Medical Report (EMR) against all patients from June 2019 to December 2019. All pediatric patients in the age group of 0–16 years were included in the study. The practicing field of referring clinicians was noted along with the maximum information that could be collected from the referral letter and were thus assessed for the quality, accuracy, and timely referral. **Results:** Out of 77 referrals received in the study period, six referral letters neither had any mention of the designation of the referring clinician nor any specific diagnosis or details. Thus, only 71 patients were included for further study. The referring clinicians were mainly ophthalmologists, pediatricians, general practitioners (GPs), and others (cardiologists, neurologists). Maximum patients were referred by ophthalmologists (76%) but visual acuity was noted only for 30% of these patients. Almost half of the referral diagnosis was accurate. Pediatrician referrals were found to be more detailed and précised. **Conclusion:** There is a need for a standardized hospital-specific format of referrals and basic training to primary care providers on some simple tests (Lights reflex tests) for identifying the “red flags” in pediatric eye examination and thus enhancing the quality and timely referral *per se*.

Key words: Ophthalmic references, pediatric patient, primary eye care, referral pattern

Childhood blindness (CB) has always been a priority in Vision 2020: The Right to Sight.^[1] Globally it has been estimated that approximately 1.42 million children are suffering from blindness, two-thirds of whom are residing in India.^[2] Childhood blindness affects the family and society. Moreover, Disability-adjusted Life Year (DALY) in a blind child is more than adult blindness. Proper screening is of utmost importance to prevent amblyopia in a child. Recent data shows that half to two-thirds of these causes of childhood blindness are either preventable or treatable.^[3] This highly suggests that there is a need for early detection with appropriate referral to a tertiary eye care center by the primary eye care providers. Tackling CB has always been a challenge in developing countries due to the lack of primary eye care centers in remote areas, lack of awareness, untimely referral by primary eye care providers, and associated socioeconomic barriers.^[4] Major initiatives need to be taken by all tertiary care centers (government or non-government) for construction of vision centers (VCs) in peripheral areas with trained ophthalmic personnel in detecting childhood eye morbidities and to familiarize the process among the referring clinicians. (Institution name redacted for review purpose) has always taken an active role in establishing vision centers across major parts of South India that are run by the

mid-level ophthalmic personnel (MLOP) with basic training of eye problem detection and referral to the base hospital. Moreover, few major VCs have also been provided with teleophthalmology services. The main mode of referral is a hard copy in developing countries, but in developed countries, the paradigm has shifted to providing an electronic-based referral.^[5] To improve the quality and layout of information provided in the referral of pediatric patients, a standard concise format of referral is important. Jones *et al.*^[6] recommended a standard ophthalmic referral form, the widespread usage of which along with strengthening the referral protocols, they believe can improve the standard of referral and therefore the service provided to patients.

Thus, this study mainly focuses on evaluating the current trend and accuracy of referral to the pediatric ophthalmology department in a tertiary eye center in Southern India to know the need for enhancing the practice pattern. It is important to make them identify the amblyogenic risk factors and urgently refer to the concerned subspecialty department. The authors believe that this study might help to find out the lacunae in referring patterns and to implicate certain guidelines to enhance the practice and thus help to eliminate blindness in children.

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: WKHLRPMedknow_reprints@wolterskluwer.com

Cite this article as: Kalita IR, Veena K, Mouttappa F, Singh HV. A study of referral pattern to pediatric ophthalmology department in a tertiary eye-care center of South-India. Indian J Ophthalmol 2022;70:223-7.

Pediatric Ophthalmology and Strabismus and ¹Vitreo-Retina, Aravind Eye Hospital, Pondicherry, India

Correspondence to: Dr. Iva R Kalita, Department of Paediatric Ophthalmology and Strabismus, Aravind Eye Hospital, Puducherry – 605 007, India. E-mail: kalitaiva3@gmail.com

Received: 31-May-2021

Revision: 21-Aug-2021

Accepted: 24-Aug-2021

Published: 23-Dec-2021

Methods

All pediatric patients (0–16 years) who were referred by clinicians to the pediatric ophthalmology department of (...Redacted for review purpose) hospital from June 2019 to December 2019 were retrospectively studied. The referral letters were reviewed from the EMR for all referred patients during the study period. The study samples comprised all routine referrals from general practitioners in community and hospitals, physicians, ophthalmologists, and other specialties such as cardiologists, neurologists, nephrologists, and pediatricians. The referrals from the vision centers that directly come under the supervision of this tertiary hospital were excluded. Once the patient reported to our hospital, their vision was tested using age-matched charts followed by a detailed ocular examination. All necessary investigations followed thereafter. The referral letters from the EMR were analyzed for the symptoms the patient presented with, the primary treatment received, and the primary reason for referral. The ocular disease was then classified based on the "International Classification of Diseases" standardized by the International Council of Ophthalmology. The reason for referral was classified into two broader headings: Nonemergency and Emergency. Nonemergency causes were further categorized as amblyogenic and nonamblyogenic causes. Nonemergency causes with amblyogenic risk factors were considered for anisometropia, strabismus, and congenital cataract. Patients categorized under emergency cases were those who required immediate attention and multidisciplinary interventions by other subspecialty departments. The visual acuity was obtained from referrals given by ophthalmologists. The referral pattern accuracy was evaluated in terms of 1. Visual acuity assessment (only in cases referred by ophthalmologists); 2. Disparity in diagnosis; and 3. Delay in reporting. Visual acuity assessment was considered inconsistent if a difference of more than two lines was found when measured in a tertiary center. The disparity in diagnosis was defined when the final diagnosis did not correlate with a diagnosis of referral, and a delay in referring was considered when more than one week's time had crossed from the day of referral. Delay in reporting was primarily considered for patients with emergencies and patients with amblyogenic risk factors. Inappropriate referrals were defined for cases that were believed manageable at lower-level eye care centers. Data were collected and entered in Microsoft Office Excel 2020 version and analyzed using the Statistical Package for Social Science (SPSS) computer software version 12.0.1 for Windows to generate frequency, percentage, proportion, and distribution. Statistical tests such as mean, median, mode, and standard deviation were determined in Graph Pad Prism software.

Results

Out of a total of 7827 new OPD cases reporting to the Pediatric Ophthalmology department in six months study period, 77 cases met the criteria for the study. Out of these 77 cases, six patients had incomplete data in the referral letter and not much information could be attained; thus, they were excluded from the study. Patients were categorized under various age groups: 1. Infant (up to 1 year); 2. Preschool (up to 4 years); 3. School going (up to 8 years); 4. Older children (up to 12 years); and 5. Adolescent (up to 16 years). The number of patients referred in various ages by referring clinicians is shown in Table 1. Maximum referrals

Table 1: Number of patients referred in various age groups

Age group	Number of referrals	Percentage
Infant (0-1 year)	16	28%
Pre-school (≤ 4 years)	11	15.5%
School-going (≤ 8 years)	19	26.8%
Older children (≤ 12 years)	16	21.2%
Adolescent (≤ 16 years)	09	8.5%
Total	71	100%

were infants (28%), followed by school-going (26.8%) and older children (21.2%) [Table 1].

Referral pattern

The number of referrals from various clinicians is shown in Table 2. Among the referring doctors, almost 76% of cases were referred by ophthalmologists, followed by pediatricians (15.5%) and others (8.5%) (neurologists, cardiologists, and GPs). The maximum referred patients by ophthalmologists belonged to the school-going age group (29%); pediatrician referrals were mostly older children (27%). The reasons for referrals were different among all referring clinicians. The information that could be gathered from the referral letter also varied. Pediatrician referrals were found to be more appropriate with detailed information and clearly mentioning the reason for referral. Among nonemergency causes, children were referred mainly for general check-up, refractive error, squint, allergic conjunctivitis, watering, digital eye strain, chalazion, or styte. Emergency causes (N = 17 cases out of 71) included blunt trauma, open globe injury (OGI), foreign body (FB), membranous conjunctivitis, congenital glaucoma or hazy cornea, retinopathy of prematurity (ROP), optic atrophy, and hypoxic-ischemic encephalopathy (HIE) sequelae [Table 3]. Emergency cases were referred mainly by ophthalmologists (N = 12), GPs (N = 2), and pediatricians (N = 3). Most of the emergency cases referred by ophthalmologists (12/54) were for FB (33.33%), followed by congenital glaucoma or hazy cornea (25%). Emergency cases referred by GPs were for open globe injury (2 out of 3 referrals by GPs). Emergency cases referred by pediatricians (3/11) were mainly for ROP, optic atrophy, and HIE [Table 3].

Among nonemergency cases (N = 54/71) referred by ophthalmologists, majority were for refractive error (27/42) followed by squint and cataract (4 in each group). GPs referred only 1 case with refractive error, pediatricians referred 3 cases for CNLDO followed by squint and congenital cataract (2 in each). Other clinicians referred cases mainly for routine check-up [Table 4].

As expected not all ophthalmologists mentioned the visual acuity in their letter. Only 16 patients (age range: 9–16 years) out of 54 referred by ophthalmologists had the mentioned visual acuity.

Accuracy of referral

Accuracy of visual acuity: The visual acuity accuracy was evaluated for the referrals from ophthalmologists. Only 16 patients out of 54 referred by ophthalmologists had the mentioned visual acuity and maximum patients were in the adolescent age group (≤ 16 years). Hundred percentage accuracy was found in the older children age group, followed by 71% accuracy in the adolescent age group and 50% accuracy in

Table 2: Number of patients referred in various age groups by various referral agents

Age group	Ophthalmologist and Ophthalmic assistants	Pediatrician	Neurologist	General Practitioners	Orthopedics
Infant (0-1 year)	8	08	-	-	-
Pre-school (≤ 4 years)	9	01	-	01	-
School-going (≤ 8 years)	16	01	01	-	01
Older children (≤ 12 years)	14	-	01	01	-
Adolescent (≤ 16 years)	07	01	-	01	-
Total (n=71)	54	11	02	03	01

the school-going age group [Table 5]. Vision was noted in the referral letter for all patients in the adolescent age group.

Diagnosis accuracy: The accuracy of referral was assessed by comparing the diagnosis for which the children were referred with the diagnosis confirmed by a pediatric ophthalmologist in the tertiary center. Almost 53% of children referred by ophthalmologists had an accurate diagnosis. 54.55% of patients (mostly infants) referred by pediatricians were proper [Table 6].

Delay in referral/reporting: This was considered mainly for patients with ocular emergencies [Table 3] and with amblyogenic risk factors (squint, cataract, anisometropia) under nonemergency causes [Table 4]. Among the amblyogenic causes, maximum children had anisometropia (18 out of a total of 28 referred for refractive error). Almost 12% of emergency cases and 37% of amblyogenic causes had delays [Chart 1].

Discussion

This study showed that although most of the referrals were appropriate, there is a lack of proper referral guidelines or a definite referral format among the referring agents. Somehow the referral of children below 7 years was less. It is of utmost importance that we identify the "red-flag signs" of ocular morbidities in children less than 7 years old because early intervention has maximum impact on the final visual outcome.^[7] Ophthalmologists were expected to mention more details about the morbidities or examination findings but it was not so. Only 30% of the total patients referred had visual acuity mentioned in the referral letter. This might reflect a lack of basic vision testing equipment (especially age-matched charts for pre-school and infants among the primary eye care providers (ophthalmologists). The reason for referral was noted more clearly by pediatricians than others. They followed a much formal way of referring and were very much particular in mentioning the associated systemic morbidities and the need for special and urgent care for the referred children.

Almost half of the patients referred by ophthalmologists were for refractive error (27/54). Two patients were referred for keratoconus (KC), but there was a lack of evidence of any astigmatism or any clinical sign mentioned for the same. On examination by a pediatric ophthalmologist, those patients were found to have simple myopic astigmatism and no KC. Anisometropia (anisomyopia and anisohyperopia) was found in 18 patients and all of them had mild-moderate amblyopia. Thus, amblyopia therapy was started for them. Being the leading cause of visual impairment globally, we expected more

Table 3: Total number of patients with emergency conditions (n=17) referred by various clinicians

Diagnosis	Ophthalmologists	GP	Pediatrician
Globe injury (open/closed)	2	2	-
Membranous conjunctivitis	2	-	-
Glaucoma/hazy cornea	3	-	-
Foreign Body	4	-	-
ROP/Optic Atrophy/HIE	1	-	3
Total (n=17)	12	2	3

Table 4: Total number of patients with non-emergency conditions (n=54) referred by various clinicians

Diagnosis	Oph	GP	Pediatrician	Others
Refractive error (Anisometropia=18)*	27	1	-	-
Suspected KC	2	-	-	-
Routine check-up	-	-	-	2
Allergy	1	-	-	-
DES/Headache	2	-	1	1
Chalazion, Styne	2	-	-	-
CNLDO	-	-	3	-
CATARACT*	4	-	2	-
SQUINT*	4	-	2	-
Total (N=54)	42	1	8	3

Oph - Ophthalmologists, KC; Keratoconus, DES - Digital eye Strain, CNLDO - Congenital Naso-lacrimal Duct Obstruction, *Amblyogenic causes

Table 5: Accuracy of visual acuity among the pediatric patients referred by various ophthalmologists

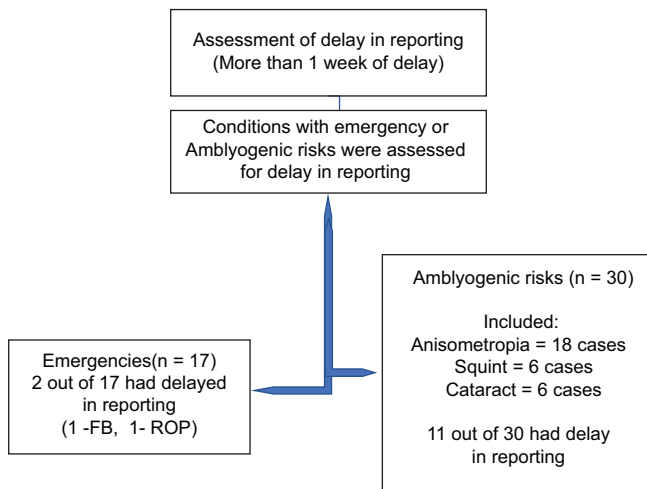
Age group	Numbers with mentioned VA	Accuracy in terms of Percentage
Infant (0-1 year)	-	-
Pre-school (≤ 4 years)	-	-
School-going (≤ 8 years)	04	2/4 (50%)
Older children (≤ 12 years)	05	5/5 (100%)
Adolescent (≤ 16 years)	07	5/7 (71%)
Total	16	100%

#Only 16 patients had mentioned VA with them

referrals for refractive error (especially myopia) or amblyopia. However, somehow the lack of knowledge in need of vision screening and lack of awareness among parents of the need of

Table 6: Diagnostic accuracy by various referral agents in percentage (%)

Age group	Ophthalmologist*	Pediatrician	Neurologist	General Practitioner	Orthopaedics
Infant (0-1 year)	5/8	4/8	-	-	-
Pre-school (≤ 4 years)	7/9	1/1	-	1/1	-
School-going (≤ 8 years)	7/16	1/1	1/1	-	1/1
Older children (≤ 12 years)	6/14	-	0/1	0/1	-
Adolescent (≤ 16 years)	2/7	0/1	-	0/1	-
Total	29/54 (53.70%)	6/11 (54.55%)	1/2 (50%)	1/3 (33.33%)	1/1 (99.99%)

**Chart 1: Flow chart showing assessment of delayed referral or reporting of the patients to tertiary eye center**

the correction of refractive error in their children might be a reason for low referrals.^[8]

Six patients were referred for squint and most of them (4/6) were mentioned to have an alternate divergent squint (two patients with esotropia). We highly appreciate such referrals because any squint (manifest or latent) in a child needs evaluation of binocularity and stereopsis or onset of suppression to prevent amblyopia.^[9]

Pediatrician referrals were mostly for the problems that are diagnosed at infancy (congenital nasolacrimal duct obstruction, retinopathy of prematurity, hypoxic sequelae, etc.). This might be due to the fact that they are examining these children more often or the parents prefer to consult a pediatrician first for any health issues related to their kids. This might even indicate the lack of knowledge among parents about the availability of subspecialty services in ophthalmology in this part of the country. No patients were referred for the same reasons by an ophthalmologist, which might indicate a lack of screening of infants by them. Children having congenital or developmental cataract were all referred by ophthalmologists/pediatricians. General practitioners might not routinely do fundoscopy or a red-reflex test/Bruckner test and can be the reason for missing these findings. They might not screen for ocular diseases but tend to make a provisional diagnosis on the basis of symptoms and refer directly without mentioning the detailed findings.^[10]

We highly appreciate the timely and accurate referral of the patients categorized under emergency causes. We received seventeen patients who really needed immediate treatment

and multi subspecialty approach. Three patients of globe injury had hyphema and severe traumatic iridocyclitis. Timely management gave these patients satisfactory outcomes. No patient had an open globe injury although one was referred mentioning the same.

Delay in reporting/referral was identified for those patients who had emergency and amblyogenic risk factors respectively as the authors believe that delay of treatment cannot be afforded in those cases. Patients who reported in our subspecialty department after 1 week from the mentioned referral date in the referral letter were considered. Thirteen out of a total of 47 patients (27%) reported late. Had it been a prospective study, we would have studied in detail the reason for the delay. The only thing the authors want to emphasize is that there is always a need for proper counseling and detailed information to be provided to the parents by the primary eye care providers about the sight-threatening conditions of their children and create awareness regarding the importance of timely consultation in a tertiary eye care center.

It is very important to design a standardized format of pediatric eye care referral in India like many internationally acclaimed tertiary eye hospitals do.^[11,12] Inappropriate referrals might lead to delay in examining patients who really need immediate attention, some conditions which if remain unattended might even cause vision loss. Proper triaging can only be maintained if all referrals have sufficient information to categorize those children according to the need. Designing a particular referral format also might reduce referral of false-positive ones, thus reducing the burden of travel to the parents and patients.

Provide access to health care in the Indian subcontinent remains a challenge.^[13] Eye care service seems to be out of the list, and it is impossible to visit tertiary eye centers for all and this becomes way more difficult when a pandemic like COVID-19 hits the country. So, we feel that it is of utmost importance to make every first-reach clinician aware of "red-flag signs" a child might present to them seeking primary care.^[14,15] It is also important to make them identify the amblyogenic risk factors and urgently refer to the concerned subspecialty department.

Limitation

1. As it was a retrospective study, we could not identify the reason for the delay.
2. Shorter duration of the study and small sample
3. Maximum referrals were from ophthalmologists which might have created a bias in study interpretation among the referring agents.

Conclusion

Most referrals to pediatric ophthalmologists were apt but almost half of referrals had an inaccurate diagnosis and almost one-third of the referrals in the emergency and amblyogenic group requiring immediate evaluation and intervention were found to be delayed. Thus, proper counselling to the parents by primary care providers emphasizing the need for prompt management in sight-threatening conditions is of utmost importance. There is a need for basic training among clinicians who are at first reach about identifying the “red-flag signs” of pediatric ocular conditions and set-forth guidelines for appropriate referral to subspecialty clinics in ophthalmology.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. World Health Organization. Program for the prevention of blindness and deafness. Global initiative for the elimination of avoidable blindness. Geneva: WHO; 2000. <https://apps.who.int/iris/handle/10665/63748>; [Last accessed on 2021 Oct 01].
2. World Health Organization. Blindness and Deafness Unit & International Agency for the Prevention of Blindness. (2000). Preventing blindness in children : report of a WHO/IAPB scientific meeting, Hyderabad, India, 13-17 April 1999. World Health Organization. <https://apps.who.int/iris/handle/10665/66663>. [Last accessed on 2021 Oct 01].
3. Titiyal JS, Pal N, Murthy GV, Gupta SK, Tandon R, Vajpayee RB, *et al.* Causes and temporal trends of blindness and severe visual impairment in children in schools for the blind in North India. *Br J Ophthalmol* 2003;87:941-5.
4. Dandona R, Dandona L. Childhood blindness in India: A population-based perspective. *Br J Ophthalmol* 2003;87:263-5.
5. Kumar KR, Yogesan K, Constable IJ. Tele- ophthalmology in India: Is it here to stay? *Indian J Ophthalmol* 2003;5:295-6.
6. Jones NP, Lloyd IC, Kwartz J. General practitioner referrals to an eye hospital: A standard referral form. *J R Soc Med* 1990;83:770-2.
7. Jutley G, Ho D, Gohil B, Khan S, Dhir L. Paediatric ophthalmology referrals: Causes of reduced vision in children and how accurate are referrals from family practitioners. *Invest Ophthalmol Vis Sci* 2012;53:6772.
8. AlHarkan DH, Altowayan RMA, Alharbi AM, Aljumaiah SM, Alhijji LI, Alkhezzy BSB. Pattern of ophthalmic referral from primary healthcare centres to secondary and tertiary hospitals in Qassim Province, Saudi Arabia. *Int Surg J* 2020;7:1763.
9. Helveston EM. Understanding, detecting, and managing strabismus. *Community Eye Health* 2010;23:12-4.
10. Harrison RJ, Wild JM, Hoblely AJ. Referral patterns to an ophthalmic outpatient clinic by general practitioners and ophthalmic opticians and the role of these professionals in screening for ocular disease. *BMJ* 1988;297:1162-7.
11. Friedman LS, Kaufman LM. Guidelines for pediatrician referrals to the ophthalmologist. *Pediatr Clin North Am* 2003;50:41-53.
12. Pediatric ophthalmology referral guidelines. Available from: <https://www.choc.org/wp/wp-content/uploads/referrals/Referral-Guidelines-Ophthalmology.pdf>. [Last accessed on 2021 May 05].
13. Kasthuri A. Challenges to healthcare in India - The Five A's. *Indian J Community Med* 2018;43:141-3.
14. Christiansen SP. Don't Miss This! Red flags in the pediatric eye examination: Introduction and essential concepts. *J Binocul Vis Ocul Motil* 2019;69:87-9.
15. Merrill K. Don't Miss This! Red Flags in the pediatric eye examination: Subnormal Acuity. *J Binocul Vis Ocul Motil* 2019;69:90-2.