Original Article

Status of pediatric eye care in India

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Purpose: To document the status of pediatric eye care in India.

Materials and Methods: A list of institutions providing eye care was compiled from various sources, including government officials, professional bodies of ophthalmologists, and national and international non-governmental organizations (NGO) working in the field of eye care in India. A questionnaire on eye care services was sent to all known eye care institutions in the country. Workshops and regional meetings were organized to maximize response. Validity of data was ensured by observational visits to 10% of the institutions who responded.

Results: Out of 1204 institutions contacted, 668 (55.5%) responded to the questionnaire. Of these, 192 (28.7%) reported that they provided pediatric eye care services. A higher proportion (48.3%) of NGO hospitals reported separate pediatric ophthalmology units compared to other providers (P< 0.001). Eighty per cent of advanced care eye hospitals had dedicated outpatient, and 40% had dedicated inpatient facilities for children (P< 0.001). The advanced eye care hospitals attended to a larger number of pediatric clients (P < 0.001), and performed more pediatric eye surgeries compared to secondary and tertiary care hospitals (P < 0.001). Eighty-three per cent of advanced care centers and 72.4% of NGO hospitals had an anesthesiologist for pediatric eye service. Refractive error was the commonest reason for seeking service. The commonest surgical procedure was pediatric cataract surgery followed by squint surgery.

Conclusion: Pediatric eye care services are not adequate in India.

Key words: Childhood blindness, eye care infrastructure, pediatric eye care

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Control of childhood blindness is one of the priorities identified for achieving the goals of Vision 2020 - the program launched by the World Health Organization (WHO) for the elimination of avoidable blindness.[1] This is considered a priority because "blind-years" (number of years that a blind person lives after going blind) due to childhood blindness are second only to cataract and because half the blindness in children is avoidable (treatable/preventable).[1-4]

The prevalence of childhood blindness varies according to the socioeconomic development of the country and the mortality rate of those under five years of age.[1,5] Four to five per cent of all blindness in the world is due to childhood blindness.[6] Very few studies have been done in India to estimate the prevalence of childhood blindness but available evidence suggests that one out of every 1000 children is blind.[7-9]

India is home to 407 million children below the age of 16 years. This accounts for 40% of the Indian population.[10] The needs of visually impaired children are different from adults both in terms of diagnosis and treatment.[1] Therefore, there is a need to develop specific skills for providing eye care to children. The need relates both to the infrastructure and the available human resources. Pediatric ophthalmology is not yet well established as a separate subspecialty in India, though there are 200,000 blind children in India.[11]

Pediatric eye care needs synergy at all levels of eye care. Primary, secondary and tertiary levels need to rise to the challenge if avoidable blindness in children is to be eliminated. Developing a pediatric eye care team and augmenting their skills is essential. It has generally been stated that there are few trained or pediatric oriented ophthalmic personnel in the country.[12] The present study was undertaken to document the status of pediatric eye care in India, so as to enable policy planners and program managers to address the problem of childhood blindness more effectively.

Materials and Methods

A study to document the available human resources and infrastructure for specialty eye care in India was conducted over an 18-month period in 2004-05. The study used a mix of approaches to triangulate and validate the data from different sources. A specially designed questionnaire schedule was developed and piloted at six institutions across the country - two Government, two Non-Governmental (NGO) and two private practitioners. A Technical advisory group constituted for the study and including representatives from the Government of India, ORBIS International and the three WHO collaborating centers for control of blindness in India (Aravind

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Eye Care System, L.V. Prasad Eye Institute and Dr. R.P. Centre for Ophthalmic Sciences) finalized the questionnaire schedule based on the feedback from the pilot survey.

A questionnaire on general eye care services was sent to all known eye care institutions in the country. Those which responded stating that they provided specialty services were then asked to provide more specific information relating to pediatric eye care. All questionnaires were administered in English.

The questionnaire was mailed to all known hospitals and clinics in the country. A list of addresses was first prepared with inputs from different sources, including the national program for control of blindness, state program officers, professional bodies of ophthalmologists, and national and international non-governmental organizations working in the field of eye care.

All questionnaires were sent by courier or by speed post to ensure that the maximal number of questionnaires could be delivered. Reminders were sent by post or telephone over a period of six months to maximize response.

In addition to the mailed questionnaires, the research team organized workshops and regional meetings to improve the response rate. Workshops were organized in Chandigarh, Jaipur, Chennai, Lucknow, Bangalore and Pune when the initial response was not adequate and a large number of institutions could be invited to a common location. These were organized to reinforce the importance of this study before the health authorities, and to motivate them to direct their officials to have these forms filled. A core group was constituted to collect information from the states in addition to the efforts made by the central data collection team. Information collected was validated by ensuring that randomly selected 10% of the responding institutions were visited by a team of dedicated eye care personnel. The observers were drawn from a number of leading eye care institutions in the country. Seventy-one institutions were visited. The information submitted by them was verified by the observers.

Only hospitals providing inpatient services were considered for analysis as it was felt that such facilities were necessary for pediatric eye care. All data was entered into a specially designed database developed in Microsoft Access. Analysis was done using Stata 9.0.

The following definitions were used in the study:

Secondary care hospital: District level/ Sub-district level hospitals where one or more ophthalmologists were available either fulltime or part-time. Services provided include refraction services, treatment and surgery for cataract. Examples of such hospitals were district hospitals, small NGO/private hospitals, community health centers (if an ophthalmologist was available), medical colleges teaching only undergraduate MBBS students with minimal ophthalmic services.

Tertiary care hospital: Hospitals at the regional/state/ zonal/district level where comprehensive eye services were provided. All diagnostic and surgical services were available so that they provided care to patients referred from the secondary level. Additional diagnostic support and surgical services for cataract, glaucoma, squint, ocular trauma etc., were available along with emergency services, but there were no fully developed specialty services. Examples include large NGO/ private hospitals, medical colleges with postgraduate ophthalmic courses (MD/MS/DNB/DO).

Advanced care hospitals: Large hospitals providing subspecialty eye services in addition to normal services offered at a tertiary care center, including low-vision services.

Teaching hospital: Hospitals/ Institutions which provided postgraduate fellowship training in ophthalmology.

Specialty trained ophthalmologists: Ophthalmologists who underwent at least six months fellowship or similar dedicated training in pediatric eye care.

Specialty oriented ophthalmologists: Ophthalmologists who underwent at least four weeks training at an institution with a pediatric ophthalmology unit.

Exclusive eye hospital: Hospitals providing only ophthalmology services.

Multidiscipline /General hospitals: Hospitals providing multispecialty services (general surgery, internal medicine, pediatrics, orthopedics, obstetrics, gynecology etc.) in addition to ophthalmology services.

Public-funded hospitals: Hospitals owned/funded by public funds and including Government, University, public sector (railways, employees state corporation, steel authority etc.), autonomous bodies under the Government and defense services etc.

NGO Hospitals: Hospitals of a charitable nature working on the principle of not-for-profit.

Private institutions: Hospitals providing eye care services on commercial terms, earning a profit from the services provided.

Results

Out of a total of 1204 institutions, 668 (55.5%) responded to the questionnaire schedule across the country [Table 1]. The majority were secondary care institutions, providing multidiscipline health services. Among the 668 responding hospitals, 192 (28.7%) reported that they provided pediatric eye care services, and provided data in relation to such services. Almost all advanced care hospitals (93.8%) provided subspecialty pediatric ophthalmology services. Information on the pediatric load, services and surgical output was analyzed from the 192 hospitals providing this data.

Among the 192 responding hospitals, a quarter reported that they had a separate pediatric ophthalmology unit to provide subspecialty services [Table 2]. A significantly larger number of advanced care hospitals reported a separate unit compared to secondary care institutions (X^2 - 60.5880; $p < 0.001$). A significantly higher proportion of NGO hospitals reported separate pediatric ophthalmology units compared to the other providers (X^2 - 24.4344; $p < 0.001$).

Dedicated pediatric outpatient clinics were significantly more common in advanced care hospitals compared to secondary hospitals (X^2 - 52.8110; $p < 0.001$) [Table 2]. These differences were also significant by provider of services with a higher proportion of NGO hospitals reporting the same (X^2

Table 1: Characteristics of responded institutions

Parameter	Number	%
Total hospitals that responded	668	100
Type of hospitals		
Secondary care hospitals	478	71.5
Tertiary care hospitals	158	23.7
Advanced care hospitals	32	4.8
Type of hospital		
Exclusive eye services	170	25.4
Multidiscipline (General) hospital	498	74.6
Ownership pattern		
Public-funded hospitals	366	54.8
NGO hospitals	184	27.5
Private hospital	118	17.7
Teaching status		
Teaching hospitals	242	36.2
Non-teaching hospitals	426	63.8
Provide specialty pediatric eye care services	192	28.7
Secondary care hospitals (n = 478)	43	9
Tertiary care hospitals (n = 158)	119	75.3
Advanced care hospitals (n = 32)	30	93.8

- 29.9765; $P< 0.001$). The frequency of running the dedicated outpatient clinics did not vary by level of service. However, it was associated with the provider, with 75% of NGO hospitals reporting a daily clinic, as against lower frequencies by other providers (X^2 - 24.1714; $P < 0.01$). Inpatient facilities for children were also significantly higher in advanced hospitals (X^2 - 31.4560; $P < 0.001$), and among NGO hospitals (X^2 - 23.9532; $P < 0.001$).

Perusal of beds per hospital also revealed that differences were significant by level of service (X^2-26.6819; $P < 0.001$) and by provider (X^2- 27.1692; $P< 0.001$), with advanced care hospitals having the highest bed per hospital rate.

Overall, the secondary and tertiary care hospitals catered to less pediatric clients on a working day, compared to advanced care hospitals. These differences were statistically significant (X^2- 27.8330; $P< 0.001$), when missing data was ignored [Table 3]. The differences were not significant by provider (X^2-3.1472; P=0.790). The morbidity profile was analyzed using the median new consultations for different conditions in a year. Refractive errors were the commonest condition for seeking attention at a hospital irrespective of the level of service and provider.

Overall, the advanced care setups performed more pediatric surgeries compared to secondary and tertiary care hospitals [Table 4]. These differences were statistically significant (X^2-29.8139; $p < 0.001$). Among providers, 9.6% of public-funded hospitals and 8.6% of NGO hospitals performed more than 500 pediatric surgeries a year. None of the private hospitals reported high-volume pediatric surgery and these differences were statistically significant (X^2-16.0298; p=0.042). Advanced care centers and NGO hospitals had a higher surgical output considering the median pediatric surgeries in a year. The commonest surgical procedure performed was pediatric cataract surgery followed by squint surgery. Keratoplasty was reported to be higher at NGO hospitals and advanced care centers. It was observed that the private sector was accessed quite often by clients for pediatric surgery, and their involvement in service delivery for children is important.

In identifying equipment required for pediatric ophthalmology, guidelines provided by WHO were considered.[13] Equipment was categorized as basic, essential or advanced. A significant proportion of the secondary level, tertiary level, public-funded and private institutions did not provide complete data on equipment. It was not possible to grade the equipment available with these hospitals.

The availability of equipment is depicted in Table 5. Majority of the hospitals had access to only the basic pediatric diagnostic equipment. Differences by service level (X^2-12.3537; p=0.015) and provider status (X^2-12.5891; p=0.013) were however significant, excluding the non-responding hospitals. It was interesting to observe that access to pediatric surgical equipment was more 'egalitarian', and differences by level of service (X-5.4740; p=0.065) or provider (X-0.0788; p=0.961) were not significant.

It was observed that available facilities in India afforded a training opportunity to ophthalmologists, but rarely to an entire pediatric team [Table 6]. A quarter of the advanced hospitals did not possess a pediatric specialty trained or oriented ophthalmologist, while 13.3% actually had the benefit of a fully trained team. The WHO has emphasized that a trained pediatric team encompassing skills of an ophthalmologist, optometrist, nurse and an anesthesiologist is needed for delivery of effective pediatric eye care.[13]

There were significant differences based on the level of service (X^2-9.9283; p=0.007) as well as providers (X^2-11.6306; p=0.003) in the availability of an anesthesiologist [Table 6]. Advanced centers and NGO providers had better availability in this regard. Access to a pediatrician was similar across different hospitals. The differences by level of service were not significant (X^2-1.0508; p=0.591), though it was statistically significant by providers of services (X^2-6.6873; p=0.032). Significant differences were also observed both for the level of service as well as the provider of service in relation to specialty trained ophthalmologists, specialty oriented ophthalmologists, ophthalmic nurses and optometrists. Uniformly, advanced centers and NGO hospitals had access to trained human resources for pediatric ophthalmology.

Discussion

A child becomes bilaterally blind every minute, primarily within developing nations. Of the 1.5 million blind children in the world, 1.3 million live in Asia and Africa, and 75% of all causes are preventable or curable.[5,14] It is estimated that 200,000 of these children are in India.[11,12] The needs of these children need to be addressed so as to be able to achieve the goals of Vision 2020.

India is a country in transition, and needs to address preventable and treatable causes of childhood blindness at the same time. Studies among schools for the blind children in India observed pattern of causes of visual loss to be intermediate between those seen in industrialized countries and in the poorest developing countries of the world.[15] Corneal causes,

Table 2: Profile of hospitals providing pediatric eye care services

Parameter	Level of service			Provider of service			
	Secondary care n (%)	Tertiary care n (%)	Advanced care n (%)	Public- funded n (%)	NGO n (%)	Private n (%)	All hospitals n (%)
Availability of separate pediatric ophthalmology unit							
Available	2(4.6)	22 (18.5)	24 (80.0)	14(13.6)	28 (48.3)	6 (19.3)	48(25.0)
Not available	41(95.3)	97 (81.5)	6 (20.0)	89 (86.4)	30 (51.7)	25 (80.6)	144(75.0)
Chi	60.58; $P < 0.001$			24.43; $P < 0.001$			
Dedicated separate pediatric ophthalmology outpatient clinics							
Available	5 (11.6)	22 (18.5)	24(80.0)	16(15.5)	30 (51.7)	5(16.1)	51(26.6)
Not available	38(88.4)	97(81.5)	6 (20.0)	87 (84.5)	28(48.3)	26 (83.9)	141(73.4)
Chi	52.81; $P < 0.001$			26.97; $P < 0.001$			
Frequency of pediatric ophthalmology outpatient service if dedicated outpatient clinic available							
Daily	2(40.0)	12 (54.5)	14 (58.3%)	3 (18.7)	21 (70.0)	4 (80.0)	28 (54.9)
3-5 days/wk	0	2 (9.1)	3 (12.5)	3 (18.7)	2 (6.7)	0	5 (9.8)
1-2 days/wk	3 (60.0)	7 (31.8)	7 (29.2)	10 (62.5)	6 (20.0)	1 (20.0)	17 (33.3)
No data		1 (4.6)	0	0	1 (3.3)	0	1 (2.0)
Chi	2.07; P=0.722			13.49; P=0.009			
Dedicated pediatric ward In hospitals providing specialty pediatric eye care							
Available	1(2.3)	8 (6.7)	12 (40.0)	3 (2.9)	16(27.6)	2 (6.4)	21 (10.9)
Not Available	42 (97.7)	111 (93.3)	18 (60.0)	100 (97.1)	42 (72.4)	29 (93.5)	171 (89.1)
Chi	31.45; P<0.001			23.95; P<0.001			
No. of ophthalmologists per hospital providing specialty pediatric eye care							
≤ 3	21 (48.8)	4 (3.4)	0	13 (12.6)	5 (8.6)	7 (22.6)	25(13.0)
4 - 6	17 (39.5)	51 (42.9)	0	34 (33.0)	19 (32.8)	15 (48.4)	68 (35.4)
7 - 10	4 (9.3)	43 (36.1)	2 (6.7)	31 (30.1)	14 (24.1)	4 (12.9)	49 (25.5)
> 10	1(2.3)	21 (17.6)	28 (93.3)	25 (24.3)	20 (34.5)	5 (16.1)	50 (26.0)
Chi	146.02; $P < 0.001$			10.51; P =0.015			
No. of eye beds available in hospitals providing specialty pediatric eye care							
< 10 beds	1 (2.3)	2 (1.7)	1 (3.3)	2 (1.9)	2 (3.4)	0	4 (2.1)
10-25 beds	15 (34.9)	21 (17.6)	1 (3.3)	9 (8.7)	13 (22.4)	15 (48.4)	37 (19.3)
26-49 beds	16 (37.2)	37 (31.1)	3 (10.0)	35 (34.0)	13 (22.4)	8 (25.8)	56 (29.2)
50+ eye beds	11 (25.6)	59 (49.6)	25 (83.3)	57 (55.3)	30 (51.7)	8 (25.8)	95 (49.5)
Chi	26.68; $P < 0.001$			27.16; $P < 0.001$			

globe abnormalities, cataract and retinal causes have been highlighted as important causes in the Indian context.[4,15-18] Recent studies in the country suggest that there is a declining trend in relation to corneal blindness.[17,18] This would therefore mean that curative services will need to be augmented and appropriate skills provided to eye care professionals.

In many countries, a child with congenital glaucoma will be referred to a glaucoma specialist; congenital cataract will be managed by an anterior segment surgeon; ocular plastic problems by an oculo-plastic surgeon; squint patients will be seen by a strabismologist.[19] Even where pediatric ophthalmology is offered as a subspecialty service, in countries like Germany, such services do not include cataract, glaucoma, orbital surgery, laser for retinopathy of prematurity (ROP) etc.[20] Therefore, children will not be provided services from one source, but would need to go to different ophthalmologists or hospitals for treatment. This is not conducive to an efficient pediatric eye care program.

There has been no formal training for pediatric ophthalmology till recently, although pediatric ophthalmology departments are now being set up in tertiary care eye hospitals. However, strabismology has been recognized as a distinct subspecialty in India for decades and many tertiary eye hospitals established a strabismus department as early as 1960.[12] Such departments do not cater only to children but provide services across all age groups. Only recently have institutions like Aravind Eye Care System, Sankara Netralaya and L.V. Prasad Eye Institute, which have been labeled as pediatric ophthalmology learning and training centers, have formalized fellowship programs in pediatric ophthalmology. More ophthalmologists are now opting for pediatric ophthalmology fellowship training.[12]

Not only in India, but in many countries, pediatric ophthalmology fellowships are of recent origin. In countries like Israel, Chile, Philippines, France, Italy, Japan and Sweden, along with many other countries, there is no formal fellowship program in pediatric ophthalmology.[20-27] Even in countries

Table 3: Outpatient service at hospitals providing pediatric ophthalmology services

Parameter	Level of service			Provider of service			
	Secondary care n (%)	Tertiary care n (%)	Advanced care n (%)	Public funded n (%)	NGO n (%)	Private n (%)	All hospitals n (%)
Number of annual pediatric outpatient consultations							
<= 3000/yr	17(39.5)	43(36.1)	3(10)	30(29.1)	21(36.2)	12(38.7)	63 (32.8)
3001 - 7500/yr	4(9.3)	24(20.2)	11(36.7)	21(20.4)	13(22.4)	5(16.1)	39(20.3)
7501-15000/yr	3(7)	7(5.9)	6(20)	8(7.8)	4(6.9)	4(12.9)	16(8.3)
> 15000/ yr	0	2(1.7)	5(16.7)	4(3.9)	3(5.2)	0	7(3.6)
Not specified	19(44.2)	43(36.1)	5(16.7)	40(38.8)	17(29.3)	10(32.3)	67(34.9)
Chi	27.83; *P* <0.001 (excluding not specified)			3.14; *P*=0.790 (excluding not specified)			
Median annual outpatient clinic consultations							
No. responding	16	45	17	38	29	11	78
Pediatric Cataract	13.5	40	192	41	171	15	68
Refractive Errors	1075	1503.5	4902	1273	2129.5	1409	1743
Pediatric Glaucoma	4	10	50	7	27	4	10
Pediatric adnexal conditions	38	70	70.5	52	78.5	65	69.5
Ocular Trauma	26.5	50	74.5	39	70	40	50
Conjunctivitis	205	209.5	300	231	187.5	412	216
Squint	17.5	50	245	43.5	111	44.5	70
Uveitis	9.5	15	19.5	15	15	8	15
Vitamin A deficiency	88	28	48.5	62.5	32	35	35
Corneal Opacity	12	82	80	59	81	23	62.5
Retinopathy of prematurity	0	2	2	0	6	4	2
Vitreo Retina	20	23	83	24	35.5	14	30

Table 4: Surgical output at hospitals providing pediatric ophthalmology services

Parameter	Level of service			Provider of service			
	Secondary care n (%)	Tertiary care n (%)	Advanced care n (%)	Public funded n (%)	NGO n (%)	Private n (%)	All hospitals n (%)
Pediatric surgery output at specialty hospitals							
< 50 / yr	6 (13.9)	9 (7.6)	1 (3.3)	6 (5.8)	3 (5.2)	7 (22.6)	16 (8.3)
51 - 200/ yr	6 (13.9)	16 (13.4)	0	14 (13.6)	4 (6.9)	4 (12.9)	22 (11.5)
201-499/yr	0	9 (7.6)	4 (13.3)	5 (4.8)	7 (12.1)	1 (3.2)	13 (6.8)
500 - 749/yr	0	4 (3.4)	4 (13.3)	5 (4.8)	3 (5.2)	0	8 (4.2)
> = 750 / yr	0	2 (1.7)	5 (16.7)	5 (4.8)	2 (3.4)	0	7 (3.6)
Not specified	31 (72.1)	79 (66.4)	16 (53.3)	68 (66.0)	39 (67.2)	19 (61.3)	126 (65.6)
Chi	29.81; *P* < 0.001 (excluding not specified category)			16.02; *P*=0.042 (excluding not specified)			
Median annual surgical procedures							
Total no. responded for all pediatric surgeries	23	72	22	61	38	18	117
All pediatric surgeries	11	37.5	265	45	103.5	13.5	46
No. responding for specific surgeries	20	61	16	51	30	16	97
Pediatric Cataract	11	30	173	35	80	12.5	35.5
Keratoplasty	0	0	6	0	3	0	1
Glaucoma	1	3	15	4.5	4.5	1	3
Dacryocystorhinostomy	1.5	2	16	2	3	1.5	2
Ptosis	1	2	12	3	2	2	3
Squint	2	5.5	40	6	11.5	4	7.5
Examination under anesthesia	8	10	42	14	12	8	12

Table 5: Equipment status at hospitals stating pediatric ophthalmology services

Parameter	Level of service			Provider of service			
	Secondary care n (%)	Tertiary care n (%)	Advanced care n (%)	Public funded n (%)	NGO n (%)	Private n (%)	All hospitals n (%)
Availability of diagnostic equipment needed for pediatric ophthalmology							
Basic	12 (27.9)	4 7(39.5)	11(36.7)	39 (37.9)	21(36.2)	10 (32.3)	70 (36.5)
Essential	2 (4.6)	15 (12.6)	10(33.3)	9 (8.7)	13 (22.4)	5 (16.1)	27 (14.1)
Advanced	0	3 (2.5)	5 (16.7)	1 (1.0)	7 (12.1)	0	8 (4.2)
No data	29 (67.4)	54 (45.4)	4 (13.3)	54 (52.4)	17(29.3)	16 (51.6)	87 (45.3)
Chi	12.35; *P*=0.015 (excluding missing data)			12.58; *P*=0.013 (excluding missing data)			
Basic: Slit-lamp; Indirect Ophthalmoscope; A scan; Keratometer, Essential: Above+ Autoref; Perkins Tonometer; Goldman/Automated Perimeter; B Scan; Advanced: Above+ Low Vision Assessment kit; Pre-verbal vision tests; Fundus camera							
Availability of surgical equipment needed for pediatric ophthalmology							
Basic	13 (30.2)	28 (23.5)	6 (20)	21 (20.4)	18 (31)	8 (25.8)	47 (24.5)
Essential	6 (13.9)	39 (32.8)	12 (40)	27 (26.2)	21 (36.2)	9 (29.0)	57 (29.7)
No data	24 (55.8)	52 (43.7)	12 (40)	55 (53.4)	19 (32.8)	14 (45.2)	88 (45.8)
Chi	5.47; *P*=0.065			0.07; *P*=0.961			
Basic surgical: Operating Microscope; Vitrectomy machine; Boyle's apparatus, Essential: Above +Pediatric anesthesia equipment; Pediatric Monitors; YAG laser							

Table 6: Status of human resources for pediatric ophthalmology

Parameter	Level of service			Provider of service			
	Secondary care n (%)	Tertiary care n (%)	Advanced care n (%)	Public funded n (%)	NGO n (%)	Private n (%)	All hospitals n (%)
Availability of trained pediatric team at hospitals reporting trained personnel							
No. of trained personnel	35 (81.4)	84 (70.6)	4 (13.3)	83 (80.6)	21 (36.2)	19 (61.3)	123 (64.1)
Only trained ophthalmologist	8 (18.6)	34 (28.6)	22 (73.3)	20 (19.4)	32 (55.2)	12 (38.7)	64 (33.3)
Trained team available	0	1 (0.8)	4 (13.3)	0	5 (8.6)	0	5 (2.6)
Chi	48.66; *P* < 0.001			37.55; *P* < 0.001			
Availability of anesthesiologist							
Available	21 (48.8)	65 (54.6)	25 (83.3)	48 (46.6)	42 (72.4)	21 (67.7)	111 (57.8)
Not available	22 (51.2)	54 (45.4)	5 (16.7)	55 (53.4)	16 (27.6)	10 (32.3)	81 (42.2)
Chi	9.92; *P*=0.007			11..63; *P*=0.003			
Easy access available to a pediatrician							
Available	21 (48.8)	55 (46.2)	17 (56.7)	41 (39.8)	35 (60.3)	17 (54.8)	93 (48.4)
Not available	22 (51.2)	64 (53.8)	13 (43.3)	62 (60.2)	23 (39.7)	14 (45.2)	99 (51.6)
Chi	1.05; *P*=0.591			6.68; *P*=0.032			
Specialty trained pediatric ophthalmologist (at least 6 months training)							
Available	0	4 (3.4)	10 (33.3)	3 (2.9)	10 (17.2)	1 (3.2)	14 (7.3)
Not available	43 (100)	115 (96.6)	20 (66.7)	100 (97.1)	48 (82.8)	30 (96.8)	178 (92.7)
Chi	36.19; *P* < 0.001			12.17; *P*=0.002			
Pediatric-oriented ophthalmologist (at least one-month training at reputed institution)							
Available	8 (18.6)	33 (27.7)	25 (83.3)	20 (19.4)	34 (58.6)	12 (38.7)	66 (34.4)
Not available	35 (81.4)	86 (72.3)	5 (16.7)	83 (80.6)	24 (41.4)	19 (61.3)	126 (65.6)
Chi	38.89; *P* < 0.001			26.11; *P* < 0.001			
Trained pediatric nurses (at least one month of training in pediatric ophthalmology							
Available	2 (4.6)	9 (7.6)	8 (26.7)	3 (2.9)	13 (22.4)	3 (2.9)	19 (9.9)
Not available	41 (95.3)	110 (92.4)	22(73.3)	100 (97.1)	45 (77.6)	28 (97.1)	173 (90.1)
Chi	11.51; *P*=0.003			15.82; *P* < 0.001			
Optometrists trained in pediatric ophthalmology (at least six months)							
Available	3 (7.0)	11(9.4)	12 (40.0)	9 (8.7)	14 (24.1)	3 (9.7)	26 (13.5)
Not available	40 (93.0)	108 (90.6)	18 (60.0)	94 (91.3)	44 (75.9)	28 (90.3)	166 (86.5)
Chi	23.18; *P* <0.001			15.81; *P* =0.003			

where formal fellowship programs exist, they are of variable duration ranging from a couple of months to two years.[28-33]

Though pediatric ophthalmology is now developing as a distinct subspecialty in India, the clinical load may not warrant a situation in most hospitals of specialty ophthalmologists working only in pediatric ophthalmology. To attract ophthalmologists to take up pediatric ophthalmology, it would be necessary to allow them to also attend to ophthalmic problems in other age groups to generate adequate professionally satisfying workloads. In countries like Singapore, pediatric ophthalmologists also maintain their general practices.[29] In fact many general ophthalmologists provide pediatric eye care services even without a formal training in many countries.[21,23-28,30,33-35]

Though a significant number of hospitals in the country have either specialty trained or oriented ophthalmologists, they are usually not supported by a trained pediatric team, as was observed in the present study. The subspecialty needs a team approach to be successful and identifying modalities of training a composite team of ophthalmologists, optometrists, nurses, anesthesiologist and counselors needs to be addressed. The WHO also strongly recommends the team approach.[13]

The present study was the first ever study in the Indian subcontinent to collect information on the status of pediatric eye care services. To gather information, the questionnaire used in this study ran into 17 pages, which was indeed a limitation. It would have required substantial time from the respondents, and could have been a reason for the response rate of 55.5%.

The WHO suggests that there should be one pediatric ophthalmology service center for every 10 million population, where at least one specialty trained or oriented ophthalmologist should be available.[13] There were 69 such centers for a population of 1.1 billion, translating to 0.63 pediatric ophthalmology service units per 10 million population. Many of these hospitals do not have a full complement of diagnostic and surgical equipment, infrastructure and supportive human resources to provide vibrant pediatric ophthalmology services. The available centers are also not homogenously distributed across the country. Better ratios were observed in the southern and western part of India as against a complete lack of services in the North and East, where only a few centers were functional. Pediatric eye care services are inadequate in India and investment of time and money, and a professional and political commitment is required to support the establishment of need-based pediatric centers.

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