Evaluation of a Screening Program to Detect Ocular Morbidity among School going Children in Theni, South India

Dr. Perumalsamy Vijayalakshmi, Dr. C.A.K. Shanmugham, Aravind Eye Hospital, Madurai

The prevalence of childhood blindness in India is estimated to be five times that of developed nations.[1,2] Studies from southern India have reported 6.5 per 10,000 children to be blind.[3,4] Previous studies have reported 16.3% to 37% of the blindness in children in India to be preventable or avoidable.[1,5] Blindness among children in India results in a total of 11.2 million blind person-years as compared to 22.5 million blind person-years for age related cataracts, and 5.5 million blind years for glaucoma.[4] However, the issue of childhood blindness in India has often been overshadowed by the relatively larger burden of adult blindness in India. The relatively higher yield for costs of screening has led to the adoption of screening a "high risk" school going population as a strategy to address blindness in children as opposed to population screening. This manuscript reports on a screening program targeting school children in Theni district of the state of Tamil Nadu in southern India.

Methods

The program was conducted in 8 schools of Theni district. The cooperation of the school authorities was sought prior to actual implementation of the program. Initial contact was made with the heads of the schools through a mailer outlining the concept of the program. This letter was followed up with a visit to the school by the program coordinator who further explained the program to the school authorities. Teachers to be provided training for screening children were identified by the school authorities after the visit by the program coordinator. The number of teachers to be trained was based on an average teacher - student ratio of 1:100. Training for teachers was organized at the base hospital.

A team comprising an ophthalmologist and ophthalmic paramedical personnel provided the training to the teachers. Each training session was for a day, and included theoretical inputs as well practical demonstrations. Inputs on the anatomy and functions of various parts of the eye were provided through interactive sessions with audiovisual presentations, including demonstrations of actual cases with morbidity. Training to measure visual acuity with a Snellens chart was provided, and validated through actual examination of children at the out patient department prior to certification. Each certified teacher was provided a Snellen illiterate E vision chart and a rope of 6 meters (to measure the distance for vision testing). The certified teachers screened children at their schools within three weeks of completion of training. Children with vision less than 6/9 in either eye, and children with obvious ocular abnormalities on torch light examination were identified for the second phase of the screening involving an ophthalmic assistant.

The program coordinator initiated the second phase of the screening by an ophthalmic assistant after the teachers completed screening of children. Children identified by teachers as abnormal and requiring further examination were re-examined by the ophthalmic assistant on a mutually convenient date at the school. The third phase of screening process involved examination of all children confirmed with ocular abnormalities and/or with vision less than 6/9 in either eye during repeat screening by the ophthalmic assistant by a clinical team from the base hospital. The clinical team comprised an ophthalmologist, a refractionist, an orthoptist, a patient counsellor and an optical dispensing unit. Vision measurements were repeated separately for each eye using Snellens illiterate E chart at 6 meters distance for each child. Refraction with streak retinoscopy and trial lens, and anterior segment examination with torchlight were performed for each child. Posterior segment examination was performed using a direct ophthalmoscope, and indirect ophthalmoscopy with a 20-diopter lens. Children with refractive errors and no previous history of spectacle use underwent refraction under cycloplegia and post mydriatic tests. Post -mydriatic tests were performed on a subsequent day in the presence of the caretaker of the child after adequate counselling to the parents. Refractive errors were considered present if the child had myopia worse than 0.5 diopters or hypermetropia worse than 2 diopter or an astigmatism worse than 0.75 diopters. Children requiring spectacles were provided the same at the screening sites through an optical dispensing unit. Spectacles were sourced free of charge for children who could not afford them. The program coordinator visited the school four to six weeks after completion of all phases of screening to follow up children who were advised treatment and to look for compliance to spectacles.

We decided to evaluate the program based on the following parameters consistent with the objectives of the project, 1) coverage of children achieved through the screening process, 2) magnitude of ocular morbidity identified in comparison to other reported studies on school aged or school children, and 3) compliance to spectacle use.

Results

Sixty six teachers from eight schools in Theni district were trained during the academic year 2002-2003. These teachers screened all 9125 (100.0%) children of the 8 schools covered by the program (Table 1). The teachers identified and referred 920 (10.1%) of these 9125 children for further examination by the ophthalmic assistant.

Total number of students (Table : 1)

Sex	Age 0 to 5 years	Age 6 to 10 years	Age 11 to 15 years	Age 16 and above	Total
Boys	68	658	1126	595	2447
Girls	143	906	4110	1519	6678
Total	211	1564	5236	2114	9125

The ophthalmic assistant further examined 909 (98.8%) of the 920 children referred by the teachers. The ophthalmic assistant confirmed ocular abnormalities in 734 (80.7%) of these 909 children. The clinical team examined 729 (99.3%) of the 734 children identified as requiring further care by the ophthalmic assistants. After clinical examination, 676

Refractive Error (Table: 2)

Diagnosis	Boys				Girls				
	Age 0-5 yrs	Age 6-10 yrs	Age 11- 15 yrs	Age 16yrs above	Age 0-5 yrs	Age 6-10 yrs	Age 11-15 yrs	Age 16yrs and	Total
Myopia		20	24	8	-	26	130	44	252
Myopia with astigmatism		7	13	1	1	9	108	23	162
Hyper metropia		1	1	2	-	5	15	1	25
Hyper metropia with astigmatism		3	1	1	-	1	8	3	17
Total	Nil	31	39	12	1	41	261	71	456

(92.7%) of the 729 children were confirmed as having any ocular abnormality; an overall prevalence of 7.4%.

Refractive errors were the most common morbidity identified (Table 2), 456 (67.5%) of all children examined by the ophthalmologist, and 5.0% of all children screened by the teachers were diagnosed as refractive errors. Strabismus was diagnosed for 11 (0.1%) of 9125 children screened. Twenty-eight children (0.3%) children had Bitot spots. Forty-three (82.7%) of the 53 children advised further examination at the base hospital came for follow up examinations to the hospital. Three hundred and seven (83.0%) of the 370 children advised spectacles were using spectacles on follow up visits 6 weeks after screening.

Discussion

The overall response rates to the screening program were good. Teachers trained through the program achieved 100% coverage of school students, while both ophthalmic assistants and clinical teams achieved over 98% coverage of referred children.

Refractive error was the major ocular morbidity present in our population and was consistent with published reports of ocular morbidity in children of these age groups. The proportion of children (5.0%) with refractive errors in our population was nearly similar to that reported from Nepal (8.1%) and Delhi (7.4%) in northern India, but much lower than reported for China (12.8%) or Chile (15.8%). The magnitude of different types of refractive errors in this population was however similar to that reported from the refractive error study in children (RESC) of a rural population in Andhra Pradesh of southern India. The proportion of children in our sample with myopia, hypermetropia and astigmatism was 4.5%, 0.5% and 2.0% compared to 4.1%, 0.8% and 2.8% for the RESC rural population of Andhra Pradesh. Similar to the distribution of refractive errors in the RESC rural population, we found an increasing prevalence of myopia with increasing age ($p<0.001$). Although there was no significant difference in the prevalence of myopia by sex in the age group of 5-10 years, the prevalence of myopia was higher among females for children aged 11 to 15 years ($p<0.001$). A higher risk for myopia among females was also reported from the RESC rural population. Comparable results with another rural population from southern India suggest that the screening process has probably been effective in identifying children with refractive errors in this population.

Screening programs targeting specific health issues have to ensure adequate provision of required care. For this project, this would mean an adequate supply of affordable spectacles that are available on a continual basis and the presence of a base hospital capable of providing pediatric ophthalmology services. We found the program achieved good success with compliance to medical advice- either follow up at the base hospital (82.7%) or use of prescribed spectacles (83.0%). Although the compliance to advice is still not optimal, an over 80% rate of compliance can be considered as reasonable especially in a rural population. It is debatable whether compliance to spectacle use may worsen if the duration of follow up was longer than the current 6 weeks.

This screening program had several innovations compared to the school screening programs initiated by the government. Major innovations that could have had an impact on compliance were using the services of a counsellor to provide advice to parents, and the provision of spectacles at site on the same day. It is highly likely that the process adopted for screening may have contributed to the reasonably good compliance achieved. However, we were unable to evaluate the potential influence of these innovations on rates of compliance as the program did not have control population to compare to.These results compare favorably with previous screening programs carried out for school children by the same organization (unpublished data) and suggest that the innovations may have had a positive impact on rates of compliance.

Our study suggests that screening programs targeting school children should also involve parents in addition to teachers in the decision making process especially with regard to spectacle use. Providing spectacles on the same day has several indirect benefits including a reduction in the lag time of advice to actual use thus possibly reducing the time for potential rejection of advice, besides reducing the indirect costs to parents who do not have to waste money and time to search for places providing affordable spectacles.

The presence of a counsellor in the team who can spend enough time clarifying issues and reinforcing advice to parents (while the clinical team can then focus on clinical examinations) may also improve compliance to advice.

References:

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4. *Gilbert CE, Canovas R, Hagan M, Rao S, Foster A.Causes of childhood blindness: results from West Africa, South India and Chile. Eye 1993;7:184–188.*
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Aravind's Mobile Screening Unit with VSAT Connectivity

The Aravind Eye Hospital with assistance from the World Diabetes Foundation has procured an advanced mobile eye-screening unit, under the Diabetic Retinopathy Project. This unit has VSAT connectivity.

The specially designed 'mobile clinic' with satellite link equipment, provided by the Indian Space Research Organisation, will help the hospital screen the retina of rural diabetic patients at their doorsteps. Experts sitting at the hospitals in Madurai and Theni will diagnose the retina "online".

The eye-diagram will be captured by a "slit-lamp" and a "fundus camera", and a total of 12 computer-captured images will be sent through satellite to the headquarters hospital in Madurai and the remote hospital in Theni. Besides, the experts can also interact with patients through a video-conferencing facility in the air-conditioned vehicle.

With this mobile clinic which could be handled by even an ophthalmology photo grapher, the services of experts could be utilized both in rural areas and at the hospital simultaneously.

The equipment can be made functional within 10 minutes after reaching the village. The ISRO has provided a 384 kbps dedicated bandwidth for the purpose.

The Diabetic Retinopathy Project, led by the hospital Director, Dr.P.Namperumalsamy, seeks to create an awareness among the rural masses of the threat posed to eye-sight by diabetes.