

Child eye health tertiary facilities in Africa

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PURPOSE	The World Health Organization and the International Agency for Prevention of Blindness recommends that there be 1 Child Eye Health Tertiary Facility (CEHTF) per 10 million people in developing countries. We sought to assess the current situation in Africa with regard to manpower, facilities, training, and output and to identify gaps in supportive services in CEHTFs.
METHODS	A survey was conducted by sending comprehensive questionnaires to all CEHTFs across Africa. Of the 27 CEHTFs in Africa, 21 (77.8%) returned forms.
RESULTS	Results show significant variability of resources (manpower, training, infrastructure, equipment, and refractive services). The mean population catchment area of the CEHTFs was 9.42 million. In 2007 the mean number of surgeries for congenital and developmental cataract, strabismus, and other conditions was 72.0, 37.1, and 169, respectively, with wide variation between the centers. Overall there were 1.26 operated boys for every girl. The mean surgical fee charged was US\$117. The presence of a dedicated optometrist, childhood blindness coordinator, and a full-time anesthetist was associated with higher surgical output.
CONCLUSIONS	Although the 21 CEHTFs cover an estimated population of 197 million, the number of children receiving services was generally low. Findings suggest that an additional 20 sub-Saharan countries are not large enough to support a CEHTF, and some large countries require additional facilities. Strengthening existing CEHTFs would require investment in manpower (especially support by optometrists and childhood blindness coordinators), programs to identify and refer children needing services, and internally and externally supported mechanisms to support the relatively high cost of providing this service. (J AAPOS 2010;14:263-266)



Introduction

In 2002 the World Health Organization (WHO) estimated the number of blind children in the world to be 1.4 million.¹ Nearly three quarters of them live in the poorest regions of the world, such as South Asia and Africa.² Most cases in the developing world are preventable or treatable, and addressing childhood blindness is a priority for the VISION 2020 initiative. Success in controlling vitamin A- and rubella-related blindness has shifted efforts to the often neglected surgical conditions.³ The WHO and International Agency for Prevention of Blindness (IAPB) recommend 1 Child Eye Health Tertiary Facility (CEHTF) per 10 million people by 2020 and provide

guidelines as to who and what should be available in such a facility.⁴

The aim of this study was to investigate current human resources, infrastructure, and equipment availability in African CEHTFs in relationship to surgical output.

Methods

We conducted a comprehensive survey of all known CEHTFs in Africa. For the purpose of this study CEHTFs were identified in several ways. Lions/WHO project facilities (6 in sub-Saharan Africa, including Sudan) were included. At the Childhood Cataract Experts Meeting in Africa meeting in Moshi (2007), participants were asked to identify all facilities known to them. Finally, regional IAPB leaders were also asked to provide information on CEHTF known to them. These methods identified 27 CEHTF throughout Africa (Figure 1). In January 2008 a detailed questionnaire (e-Supplement 1, available at jaapos.org) was mailed to all of the CEHTF. The designated ophthalmologist was asked to return completed surveys by email or facsimile. No incentive (financial or otherwise) was given to anyone for completing the questionnaire.

The questionnaire comprised detailed information about human resources (including number and type of personnel, training provided, and educational resources), infrastructure (including

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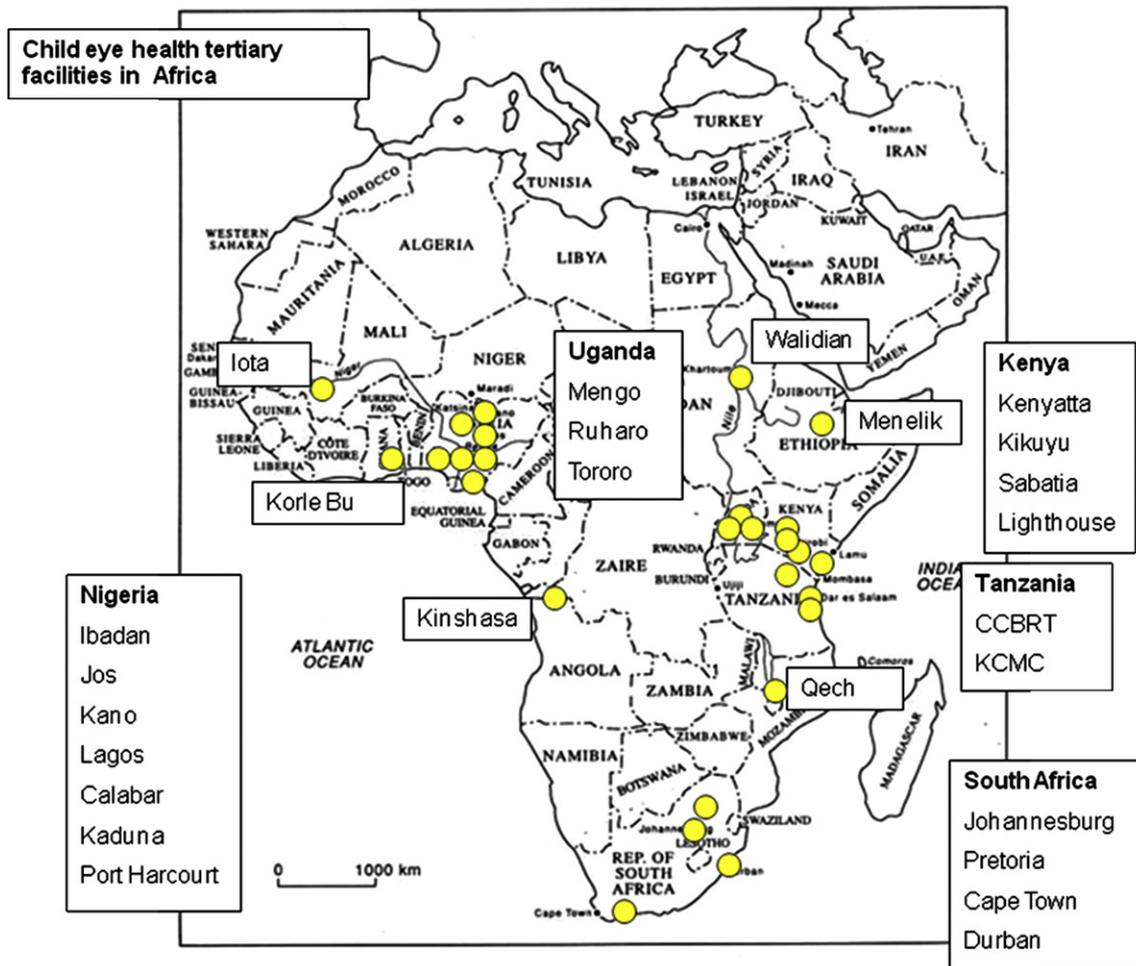


FIG 1. Child eye health tertiary facilities in Africa.

equipment and consumables, operating room space, outpatient space), services provided (services provided in 2007; community-based programs; and financing of surgical, programs, refractive, and low vision services), and national coordination. Questionnaire responses were entered to and analyzed using SPSS 11 software (SPSS Inc, Chicago, IL). Pediatric cataract surgical rate⁵ was calculated as total number of eyes receiving surgery for congenital or developmental cataract in the center divided by its total catchment population in millions. Factors associated with higher numbers of children receiving surgery and higher pediatric cataract surgical rates were assessed using simple bivariate χ^2 tests.

Results

Of the 27 CEHTFs identified, 21 (77.8%) responded to the questionnaire; the 6 nonresponding centers were in Mali (1), Nigeria (3), and South Africa (2). All ophthalmologists reported that they had undergone fellowship training in pediatric ophthalmology. Overall, 4 (19%) hospitals have a full-time pediatric anesthetist on duty, and 52% have a part-time pediatric anesthetist on duty. In the rest, the anesthetists are contracted from another

hospital. Only 55% of the anesthetists are qualified doctors; 45% are paramedical staff trained in pediatric anesthesia. Support staff included the following: childhood blindness coordinator (4 centers, 19%), a dedicated counselor (generally both for children and adults, 6 centers), low-vision technician providing postoperative services (14 centers, 66.7%), an optometrist providing postoperative refractive services (17 centers, 81%), and an orthoptist (3 centers, 14.3%).

Two centers (1 each in Tanzania and South Africa) offer a pediatric ophthalmology fellowship, while 6 facilities (28.6%) provide training in pediatric ophthalmology for ophthalmology residents. Training in general ophthalmology is provided at 15 centers (71.4%) and all except 4 provide training to midlevel personnel (primarily ophthalmic nurses). Eighteen centers (85.7%) have at least 1 textbook on pediatric ophthalmology, while 7 (33.3%) receive journals on pediatric ophthalmology; all except 1 hospital had access to the Internet.

A dedicated pediatric ophthalmology outpatient department is present in 10 hospitals (47.6%) and 5 (23.8%) have a dedicated pediatric eye ward. Only 1 center has a theater

Table 1. Costs of providing services

	N	Minimum	Maximum	Mean
Estimated costs per congenital cataract surgery	19	\$90	\$1100	\$340
Per eye fee charged patients for congenital cataract surgery	19	0	\$350	\$117
Cost of spectacles	17	0	\$200	\$59
Cost of low vision devices	11	0	\$120	\$31

Values have been converted to \$US.

dedicated to children's eye surgery; 16 (76.2%) have dedicated general eye theaters, and 4 (19%) centers share with nonophthalmic surgical services. Intraocular lenses are commonly used in 17 (81%) centers, rigid only in 8, and both foldable and rigid in 9. The average cost of providing surgery for congenital or developmental cataract was reported to be US\$340, while the average fee charged was \$117 (Table 1). Three centers reported that surgery was provided free.

The centers reported that they estimate that just over 90% of children with congenital or developmental cataract surgery receive at least 1 follow-up visit; however, the centers' estimates for spectacles (62%) and low-vision service (15%) are considerably lower. Spectacle frames for small babies were available at 10 centers (47.6%); frames for young children were available at 16 (76.2%) centers. Other optical devices were available as follows: executive bifocals (11, 52.4%), high "plus" add spectacles (11, 52.4%), stand magnifiers (13, 61.9%), handheld magnifiers (16, 76.2%), and telescopes (14, 66.7%). Parents have to pay for spectacles at 16 (76.2%) centers and for low vision devices at 11 (52.4%).

Thirteen (61.9%) centers reported having a national VISION 2020 plan that refers to the development of CEHTFs.⁵ Screening programs in communities aimed at identifying children in need of surgical services are undertaken by 7 (33.3%) centers, with the remainder relying on external programs (community based rehabilitation in 15 [71.4%], by a society for the blind in 14 [66.7%], by radio in 15 [71.4%], by health personnel in 11 [52.4%], by general outreach in 6 [28.6%], by key informants in 18 [85.7%], and by other methods in 15 [71.4%]). Centers reported the following measures to encourage follow-up: calling parents by phone (15, 71.4%), personal visits (18, 85.7%), providing good counseling to parents during hospital visits (10, 47.6%), and reimbursing transport costs (16, 76.2%).

In 2007, 4,702 surgeries were carried out, including 1,369 for congenital or developmental cataract and slightly less than half that number for strabismus (Table 2). There was significant variation between institutions; centers in eastern Africa reported large numbers of congenital and developmental cataract surgeries, while a center in South Africa reported a large number of strabismus surgeries. Boys consistently outnumbered girls (with the notable exception of Sudan), and overall there were 1.26 boys receiving surgery for every girl.

Only 15 centers (71%) could suggest the extent of their catchment areas. Among them, the mean catchment area was 9.4 million people. Factors associated with higher numbers of children receiving surgery for congenital/developmental cataract were as follows: presence of full-time anesthetist ($p = 0.05$), presence of a childhood blindness coordinator ($p = 0.002$), and presence of an optometrist providing postoperative refraction ($p = 0.016$).

Discussion

This survey is the first report of facilities providing eye care tertiary services for children in Africa. The 28 identified centers are located in 10 of the 42 countries that make up sub-Saharan Africa. Many countries are too small to support a CEHTF, and it is not practical to simply divide the total population of sub-Saharan Africa by the numbers of centers: in many countries parents would find it difficult to take their children to a CEHTF in neighboring countries. Thus it would not be unrealistic to think that within the next 10 to 20 years CEHTFs could be developed in an additional 20 countries. Some very large countries, such as Nigeria (total population about 120 million, with 7 centers currently) and Ethiopia (total population about 70 million with 1 center currently), need to plan for the development of additional facilities. All centers need to clarify their catchment area and the development of new facilities should be in places where there is a need; developing new CEHTFs in cities with existing facilities will likely lead to wasted resources and confusion.

Our findings suggest that CEHTFs need considerable strengthening to meet the needs of the children in their catchment area. Using the estimate of 20-30 children with incident congenital cataract per million populations⁶ and the mean catchment population (9.4 million) of the 21 centers, there should be between 4,000 and 6,000 surgeries for congenital and developmental cataracts at these centers every year; in 2007, 1,368 surgeries were performed.

There was generally a level of access to theaters, trained surgeons, anesthetic staff, microscopes, and intraocular lenses sufficient to allow greater productivity than was reported. While only 1 center reported a dedicated pediatric eye theater, such a facility would be unusual even in a Western setting and in general pediatric cataract services are provided in high-volume adult cataract centers where theater staff are used to eye operations. In addition there is a better chance of income generation from adult cataract patients, which may be used to subsidize pediatric services. Studies from eastern Africa have shown problems with delayed presentation and limited follow-up of children with cataract,⁷⁻⁹ explaining why a comprehensive approach to services is needed in addition to liaison with and funding for community programs. Lack of follow-up and lack of refractive correction remain considerable obstacles to proper rehabilitation in children. Strategies for developing comprehensive approaches and community activities have been published.¹⁰

Table 2. Children receiving surgical services in 2007

	Mean no. boys having surgery (CEHTF reporting)	Mean no. girls having surgery (CEHTF reporting)	Mean no. boys and girls having surgery (CEHTF reporting) ^a
Surgeries for congenital/developmental cataract	40.9 (n = 13)	37.8 (n = 13)	72.0 (n = 19)
Surgeries for strabismus	11.9 (n = 12)	10.4 (n = 12)	37.1 (n = 17)
Other surgeries	114.3 (n = 9)	82.9 (n = 9)	169.0 (n = 16)

^aSome CEHTF only reported total children receiving surgical services (no data disaggregated by sex): totals reflect both those reporting sex disaggregated data and those without sex disaggregated data.

Factors associated with higher output from these centers included presence of support staff (eg, optometrists, childhood blindness coordinators, and anesthetists), but our data do not show whether centers opting to employ more support staff experience increased output or busier units simply employ more staff to meet increased activity levels. Whichever the case, CEHTFs wishing to improve productivity should plan for staff recruitment and training.

Studies in the past in Africa have identified gender bias with regard to seeking healthcare services, with girls generally being neglected.⁷⁻⁸ Our findings confirm the bias toward boys for general surgical care and surgery for congenital cataract or strabismus. It should be noted, however, that only about half of the CEHTFs were able to provide information separately for boys and girls. Continuing to monitor surgery statistics disaggregated by sex is recommended.

Our study results are limited by the response rate (78%), and we have no information on the centers not returning forms; the more developed infrastructure in South Africa has not been adequately captured in this study. The fact that many centers do not report findings routinely is troubling; besides providing data disaggregated by sex, centers are encouraged to monitor where children come from, as this helps in identifying areas that have low uptake.

In conclusion, although recommendations⁴ and best practices¹⁰ have been published, there is a wide range of service level, facilities, and human resource availability in Africa. Improving the services (including productivity and range of postoperative care) will require investments in staffing and in programs aimed at bringing children to hospital and ensuring that systems for good follow-up are implemented. For instance, as previously reported, despite delayed presentation, two thirds of children operated for bilateral cataract (and with adequate follow-up) achieved

visual acuities of at least 6/18 in 1 eye,¹¹ generally adequate to access mainstream education without special support.

While recognizing that provision of this pediatric eye care is expensive, the benefit of restoring sight to a child is likely to significantly outweigh the costs.

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