



## Cataract Surgical Services in Kwara State, Nigeria

F. G. Adepoju<sup>1\*</sup>, Daksha Patel<sup>2</sup>, A. A. Ayanniyi<sup>3</sup>, B. J. Adekoya<sup>4</sup>,  
C. O. Omolase<sup>5</sup> and K. F. Monsudi<sup>6</sup>

<sup>1</sup>Department of Ophthalmology, University of Ilorin, Kwara State, Nigeria.

<sup>2</sup>International Centre for Eye Health, London School of Hygiene and Tropical Medicine, Keppel Street, London WC1E 7HT, UK.

<sup>3</sup>Department of Ophthalmology, College of Health Sciences, University of Abuja, PMB 117, FCT, Nigeria.

<sup>4</sup>Department of Ophthalmology, Lagos State University Teaching Hospital, Ikeja, Lagos State, Nigeria.

<sup>5</sup>Department of Ophthalmology, Federal Medical Centre, PMB 1053, Owo, Nigeria.

<sup>6</sup>Department of Ophthalmology, Federal Medical Centre, PMB 1126, Birnin Kebbi, Kebbi State, Nigeria.

### Authors' contributions

*This work was carried out in collaboration between all authors. Authors FGA, DP designed the study, performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript. Authors BJA and COO managed the analyses of the study. Authors KFM, AAA worked on the writing of the final manuscript and managed the literature searches. All authors read and approved the final manuscript.*

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### ABSTRACT

**Introduction:** Service provision for tackling cataract blindness is a key priority and remains a challenge for eye care programs in Nigeria. At the moment, paucity of data on these services makes evaluation and effective planning difficult.

**Objective:** To evaluate the infrastructure, equipment, and human resources for cataract surgical services, and determine the cataract surgical output in Kwara State, Nigeria.

**Materials and Method:** A descriptive cross-sectional study of all cataract service institutions in Kwara state was conducted in May-July 2008 using pre-tested questionnaire and on-site review. Output data for 2003-2007 was collected and channels

\*Corresponding author: Email: feyiyemiade@yahoo.com;

of yearly reporting of cataract surgical output for 2008-2009 established. Descriptive and analytical statistics were performed. For all comparisons, statistical significance was indicated by  $p < 0.05$ .

**Results:** There were 14 cataract surgical centres (9 Base Hospitals and 5 Surgical Outreach Centres); all the Base Hospitals were located in the urban centres with over two third cited in Ilorin, the state capital. The state had adequate equipment and infrastructures; however they are mal-distributed in favour of urban areas.

A total of 157 eye care workers comprising 12(7.6%) ophthalmologists (consultants=8, Diplomates=4), 16(10.2%) trainee ophthalmologists, 94(59.9%) mid-level ophthalmic personnel and 35(22.3%) support staff serve the state's 2.37million people. Eighty per cent of the eye care workers reside in the state capital where less than 30% of the population lives. Cataract surgical output increased from 218 in 2,003 to 1020 in 2009.

**Conclusion:** There is adequacy of infrastructure, equipment and human resources with improving cataract surgical output. To attain vision 2020 target, mal-distribution of infrastructures, equipment and human resources and poor staff mix need to be addressed. There is urgent need for establishing state- and nation-wide systems for reporting cataract surgical output.

*Keywords: Cataract services; resources; infrastructure; equipment: Output; Kwara State.*

## 1. INTRODUCTION

The global estimates of visual impairment and blindness stand at 161 million and 37 million respectively, excluding refractive error [1]. This burden of blindness is higher in Africa, 1.0%, compared to 0.3% in Western Europe and North America [1,2]. Cataract accounts for 50.0% of this global blindness burden, with at least 80.0% of the cataract blind residing in developing countries [3]. Nigeria, with a population of 140 million, is estimated to have 1.13 million blind adults aged 40 years or older, with cataract accounting for 42.9% [4].

At present, the number of cataract surgery per million population per year (CSR) in Africa ranges from 300 in Nigeria to a maximum of 500 in other developing African countries. These figures are well below the recommended figure of 2000-4000 needed to eliminate cataract as a major cause of blindness [5].

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In 2001, Ogundimu [6] while looking at the cataract service in the Western region of Nigeria put the cataract surgical rate at 300; such estimates from pockets of studies are often used to arrive at national figures as data on cataract output from most developing countries are not available. Reasons for such low output has being repeatedly evaluated bothering on issues of low demand as well as deficiencies in supply of cataract surgical services [7-13]. A possible factor responsible for low demand, aside cost and fear, is poor outcome of cataract surgery. In the national survey involving 217 post cataract surgery persons, only 29.9% (WHO benchmark, 80%) had presenting visual acuity outcome equal to or better than 6/18. This improved to 55.9% (WHO benchmark, 90%) after spectacle correction [14].

Studies on situational analysis of the available cataract surgical services will provide needed data for proper evaluation and planning at both national and regional levels. This study, therefore aimed to provide data on infrastructure, equipment and human resource for

delivery of cataract surgical services, and assess the CSR in Kwara state, Nigeria. The generated data will assist eye care planners and implementers in strategizing for increased CSR, and optimising cataract surgical outcomes.

## **2. MATERIALS AND METHODS**

### **2.1 Background Information**

Kwara State, one of the 36 states of Nigeria, is located in the Nigeria's North Central geopolitical zone with Ilorin as the state capital. It is sub-divided into 16 local administrative sub-units or Local Government Areas (LGAs) and has a population of 2.37 million [15] and a total of 7,227 cataract blind backlogs. The state's population has a literacy level of 50.4%, are predominantly farmers with low socio economic status and about 70% of the population is rural.

### **2.2 Design**

The study was a descriptive cross-sectional survey of all surgical institutions offering cataract services in the state. The list of all registered Eye clinics/Hospital was obtained from the State's Ministry of Health; this was supplemented by information from contact groups such as the identified hospitals and eye care workers (ECW) naming any known hospitals providing cataract surgical services in their surroundings. This became necessary as it was discovered that not all clinics/hospitals offering services were registered with the Ministry of Health. The selection criterion was any hospital or clinic with an eye unit offering regular cataract surgery between year 2003 and 2007. Data on surgeries performed in surgical eye camps, although not a common occurrence, where found, was added to the figures of the affiliated/base hospital. A visit by the principal investigator to all the identified institutions was carried out for familiarization and introduction. Permission was obtained from the head of each institution after presentation of a formal letter detailing the purpose of study. Telephonic introduction was made to centres far from the state capital or when meeting during first visit failed. A hospital questionnaire was used to obtain information on location, ownership, available facilities such as clinic spaces, dedicated theatre and pharmacy. Data on cataract surgical output and outcome, available human resource and equipments were also obtained from the head of each eye care institution and review of records. Residents' doctors who are undergoing training and also operate under supervision are excluded in calculating Ophthalmologist to population ratio. The list of available equipment at each centre was compared with the standard list set by "Standard List for a Vision 2020 Eye Care Service Unit" and Technology Guidelines for a district Eye care programme compiled by Technology Working Group of Vision 2020 [16]. Subsequently, the functionality of each equipment was assessed.

Using a pre-tested questionnaire the investigators obtained data eye care personnel data on cadre, sex, age, place of residence; qualification and participation in continue medical education. Electronic copy was sent to staff not on ground for reasons of annual leave or undergoing training outside their primary place of work. The questionnaires were filled in the presence of the team without interference except where the respondent asked for clarification. The filled questionnaires were immediately checked for completeness and appropriateness and where necessary returned for corrections.

Collated data on output in many institutions were not available and the investigators had to retrieve information from the available documents such as patient's folders and record, theatre session list or operation list and nursing records.

Incomplete and missing data were excluded. Channel of reporting for the state was opened to collect data for 2008 and 2009 by nominating an individual from each organisation to compile data and send electronically to the lead author and the appropriate office at the ministry of health.

### **2.3 Research Team**

The research team comprised of one Ophthalmologist, two resident doctors and three research assistants. The research team held briefings twice before the study for familiarisation with the study's objectives and approach. One-day training was then carried out on the use of the questionnaires including practical session. Pre-test was carried out with the tertiary institution and some staff of the institution by applying the hospital and staff questionnaire. Specific interest was to note if all staff cadres were captured as well as the definition of each cadre.

Data entry and analysis using Excel spread sheet and SPSS 16 was done. Frequencies, proportions, percentages and personnel to population ratio were calculated, chi square was used to test significance at a level of 0.05.

### **2.4 Ethical Considerations**

Ethics approval for the study was obtained from the Research Ethics Committee, the Institutional Review Board of the University of Ilorin Teaching Hospital and the London School of Hygiene and Tropical Medicine as the research was carried during the MSc program in community eye health. Permission was also obtained from the head of each eye care institution visited. Also, written informed consent was obtained from each respondent

## **3. RESULTS**

### **3.1 Surgical Centres and Equipments**

A total of 14 surgical centres provide cataract services for the state; these comprised 9 base hospitals and 5 surgical outreach centres. All (100.0%) of the 9 base hospitals are cited in the urban areas where only 30% of the population reside as shown in Fig. 1. Furthermore, The spread in the urban areas is uneven as 7 out of the 9 hospitals are cited in Ilorin, the state capital, and the remaining 2 in towns an hour drive away. The 5 surgical outreach centres are fairly well distributed. Two (14.3%) out of the 14 surgical centres are under the Tertiary hospital, eight (57.1%) under the State and four (28.6%) are private initiatives.

The base hospitals possess major equipment as outlined in Table 1.

All equipments were functional except a slit lamp and three direct ophthalmoscopes. The state hospitals have shared beds with other surgical units. The outreach centres only serve as regular visit sites providing weekly clinic and monthly surgical services. The major equipment like microscopes, surgical instruments are transported as required to and fro the outreach centres. Basic equipment like direct ophthalmoscopes, refraction boxes were available. Instrument for biometry was not available in many of the private sector. Yag laser and vitrectomy machine were found in the state only.

### 3.2 Human Resources

There are 157 eye care workers, 27(17.20%) males and 130(82.80%) females with mean age 40.37 SD 8.67 years in the state actively involved in the delivery of cataract services. Half of them are in the State government employees Table 2.

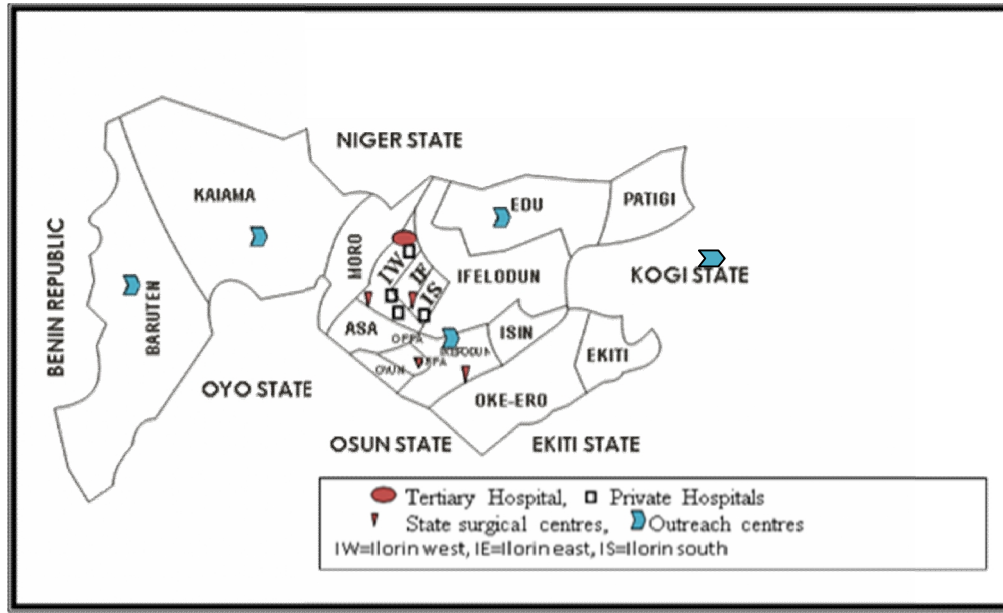


Fig. 1. Map of Kwara State showing cataract surgical centres

Table 1. Available equipment

Item	Tertiary	Private	State	Total
Operating microscope	2	3	8	13
Operating table	2	2	7	11
Operating theatre	2	2	9	13
Cataract set	2	3	20	25
Vehicles	2	0	3	5
Motorcycle	0	1	7	8
Slit lamps	2	3	6	11
Direct Ophthalmoscope	4	7	35	46
Indirect Ophthalmoscope	1	2	2	5
Retinoscope	2	2	4	8
Keratometer	1	1	3	5
A Scan ultrasound	1	1	2	4
Visual Field Analyser	1	1	2	4
Yag Laser	0	0	1	1
Refraction Facility	3	1	1	5
Optical workshop	1	0	1	2
Autorefractor	1	0	1	2
Vitrectomy machine	0	0	1	1
Dedicated eye Bed	40	18	-	58

**Table 2. Staff mix and other output parameters for the different providers**

Cadre	Hospitals		
	Private	Tertiary	State
Cataract surgeon	1	6	5
Trainee ophthalmologist	0	16	0
Refractionists	1	1	7
MLOP	9	24	52
Administrative staff	3	8	3
Support staff	4	6	11
Total (%)	18 (11)	61 (39)	78 (50)
Cost of surgery(\$)	285	110	40
Surgery/surgeon/year	47	47	370
CME (%)	74	75	63
Monitoring	No data	Done	Done

*Mid-level Ophthalmic personnel (MLOP) include General Nurses, Ophthalmic nurses, eye care managers. Continuous Medical Education (CME)*

All the Ophthalmologists, Refractionists, and half of the diplomats work in the state capital as well as 80% of the other eye care workers (ECW).

### 3.3 Cataract Surgical Output

There was a steady increase in cataract surgical rate from 218 in 2003 to 1020 in 2009. The number of surgery per year per centre is shown in Fig. 2. While the trend in rate and output is services are reported in Fig. 3 and Table 3. Conventional extra capsular cataract surgery with intra ocular lens implantation (ECCE-IOL) is the routine method of choice for cataract extraction (80.0%) and small incision cataract surgery (SICS) 20% in 2007. The proportion of surgery by SICS increased to 55% in 2009

### 3.4 Direct Cost of Surgery

The average cost of surgery range from 40US dollars in state hospitals, 110US dollars in the tertiary to 285US dollars in private hospitals-Table 1. A dollar exchanged for about 120 Nigerian Naira, minimum wage is 100US dollars per month during the study period. Surgical output is highest in the centre with the lowest cost.

### 3.5 Monitoring

Regular monitoring is done in Tertiary and in some State surgical centres but data on monitoring is not available in the private hospitals.

Overall, the visual outcome of surgeries, without correction, at two months was good (VA6/6-6/18)-67%, borderline (VA 6/24-6/60)-23% and poor (<6/60)-10%. Post-operative refraction was not routinely performed.

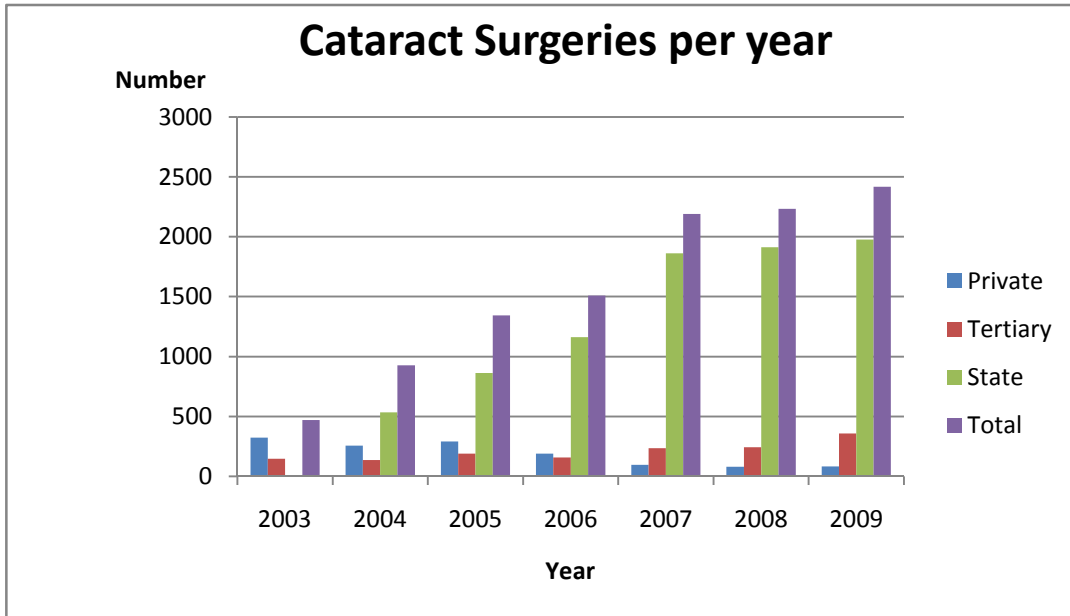


Fig. 2. Cataract surgeries per year

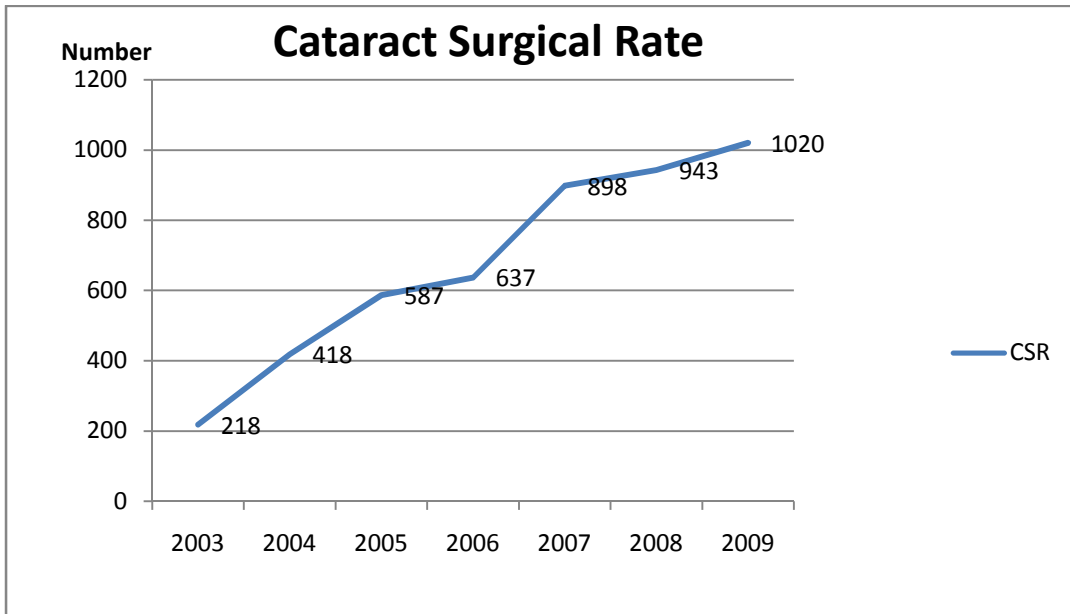


Fig. 3. Trend in cataract surgical rate in the state

**Table 3. Summary of cataract service by the state between 2003-2007**

<b>Year</b>	<b>New cases</b>	<b>Review cases</b>	<b>Inserted IOL (%)</b>	<b>No of cataract surgeries</b>
2003	5,000	10,000	53	470
2004	4,000	8,560	61	927
2005	5,630	24,600	74	1344
2006	5,956	32,390	86	1509
2007	6,089	51,203	97	2191
2008	6,897	52,788	96	2234
2009	7,192	55,231	97	2417

## **4. DISCUSSION**

### **4.1 Human Resources**

The state has adequate ophthalmologists and excess of ophthalmic nurses going by the recommendation for Vision 2020 human resources [16,17]. Cataract surgeon in this study comprise of the Ophthalmologists and the Ophthalmic diplomat who are medical doctors that has had eighteen month training in Ophthalmology. An Ophthalmologist per 250,000 populations is a great departure from the generally poor numbers of Ophthalmologists in Africa put at less than 1 per million populations [18]. The poor distribution on favour of the urban however, is the issue as previously reported in many other places [13,19,20]. The presence of ophthalmic diplomates had assisted in improving service to places away from the state capital as shown by half of the category of surgeon residing out of the state capital. It is hoped this will remain so in the nearest future. The contribution of State run hospital, noted to be high, is primarily attributable to the diplomats as shown in the result, this is as earlier anticipated when this cadre was established in Anglophone west Africa countries [21]. There should be concerted effort to achieve equitable distribution of surgeons as well as other eye care workers.

### **4.2 Surgical Output**

In 2003 the cataract surgical rate was 218 and this progressively improved to 1020 by 2009. The other output parameters such as average number of operations per surgeon, total number of outpatients reviewed also showed similar trend. The increase, although appreciable, is not matched by the increase in the human resources of for instance 2 ophthalmologists in 2001 as documented by Ogundimu to 8 in 2007. This is also below the target suggested by WHO, 2000-4000, to achieve vision 2020 objectives. Setting a target of cataract operations per surgeon per year as earlier suggested by trainee resident doctors[22] and has being done in India with a target of 700 could be helpful. The general problem was low uptake as all the centres had no waiting list and there is reduce efficiency of the human resources particularly in the tertiary centres. It is observed that the major contributor to the increase in the output is the Kwara Eye Care Program while the output in the private sector and tertiary institution had remained static or is dwindling, this difference was significant. However, cost might be a major reason as state service offering surgery at a reduced cost was observed to have more surgical output. Other possible factors are support from donors and improved community involvement in the state service provision. The Kwara State eye care program (KECP) carries out more outreaches per year, this community involvement through outreaches need be improved upon generally and more by the tertiary institution. The positive effect of increasing community screening for cataract as well as the



challenges is detailed in some works [23-25]. The present approach of waiting in the clinics for patient visit will probably not lend itself to increase output. A mind shift of surgeons in our setting in this aspect is important. More facilities and enabling environment by tertiary and private institutions is required. The management will also need be sensitised to this need and encouraged to have a paradigm shift. The number of surgeries per surgeon per year is inadequate particularly in the tertiary institutions where residency training is on-going. Although an Ophthalmologist does more than cataract surgery but in view of the contribution of cataract to global needless blind, there should be concerted effort to increase the output considerably. In addition, collaboration between high and low output centres will ensure adequate exposure of trainee Ophthalmologists to surgical skills. Of concern is the sustainability of this increasing CSR in the event of withdrawal or reduction of support from the non-governmental organisations (NGO). Therefore, efforts should be directed at a self-sustaining program and drive for local support.

#### **4.3 Infrastructures and Equipment**

The 14 centres offering surgical services are adequate but mainly concentrated in the big city where less than 30% of the population resides. This leaves many underserved area far from the cities and with difficult terrain further making access a challenge. Future plan should include making service accessible to these areas by use of surgical centres. The present three month compulsory community service by residents, with supervision of consultants, to underserved communities might also address this issue as well as extension and more frequent outreach screening camps to these communities. Generally the equipment are adequate and functional, yag laser, biometry and vitrectomy machines should be procured.

Overall, the visual outcome, after best correction, at two months could not be assessed due to paucity of post-operative refraction data. However, the average percentage good outcome at two months, without refraction was 67%. This is below the WHO-recommended figure of 80%. A study assessing visual outcome in the tertiary centre prior to advent of biometry in 2004 [26] found a best corrected visual acuity at two month of 83.8%. Routine post-operative refraction was noted to be low in the study from the three sectors. Adequate surgical output monitoring and refraction with prescription of glasses post surgery should be encouraged and practised by all. Various studies have shown that refractive errors account for a large percentage of poor vision after cataract surgery [14,26-28]. There is increasing conversion to small incision cataract surgery in the state and this requires further training as the outcome is shown to be better with earlier rehabilitation [29-31].

It is noteworthy that continuing medical education is regularly done in all the service provision institutions. About 75% of ECW regularly have continuing medical education (CME); this should be encouraged and improved upon. The CME were not standardized and had no attached CME credits. These would have permitted an objective assessment of the CME. There is no process in place for documentation and collation of output data on cataract service by service providers in the country as a whole. The national prevention of Blindness vision 2020 groups working with the ministry of health can effectively take up this task as the frame work for implementation is already in place. This study has limitations of possible under estimation from incomplete or missing data. Bias in the responses obtained since the principal investigator is known to many of the respondent. The availability of equipment does not guaranty usage; this study cannot answer the question on appropriate usage of the available instruments and the impact on patient care.

## **5. CONCLUSION**

There is adequacy of infrastructure, equipment and human resources with improving cataract surgical output. To sustain and improve the increasing cataract surgical services there should be improved access to care particularly by the underserved. SICS, biometry, post-operative refraction and monitoring of outcome should be standard of care. A system for cataract services reporting should be in place in the state and by extension Nigeria.

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## **COMPETING INTERESTS**

Authors have declared that no competing interests exist.

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