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Assessing the cataract surgical rate and gender equity in cataract services in south-east Nigeria

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ABSTRACT

Background In 2020, almost 100 million people were blind or visually impaired from cataract. Cataract surgery is a cost-effective treatment for cataracts. In Nigeria, twice as many women are cataract blind as men. Cataract surgical rate (CSR, the number of cataract operations per million population per year in a defined geographical location) is an output indicator of cataract surgical services. The recommended target CSR for sub-Saharan Africa is 1000/year. The aim of this study was to assess the CSR in men and women in Imo state, Nigeria.

Methods A retrospective review of cataract surgery undertaken in all eye health facilities in Imo State in 2019. Data collected included the type and location of facilities, patient demographics and the number and type of cataract operations performed in each facility. The CSR was calculated overall, in men and women, and in younger and older women.

Results The CSR overall was 330/million and was slightly higher in women (347/million) than in men (315/million) (p<0.001). More elderly women (≥65 years) accessed cataract surgery through outreach than men and younger women (OR 1.5 (95% CI 1.03 to 2.22, p=0.03) and 1.6 (95% CI 1.07 to 2.44, p=0.02)), respectively.

Conclusion The overall CSR in Imo state was approximately one-third of that recommended for sub-Saharan Africa. Although the CSR was higher in women than in men, considerably higher CSRs are needed in women to address their higher burden of cataract blindness. Operational and intervention science research are needed, to identify and evaluate interventions which address demand and supply barriers to accessing cataract surgery, particularly for elderly women.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ In Nigeria, the prevalence of cataract blindness in women is almost twice the prevalence in men, and there is gender disparity in access to cataract surgical services.

WHAT THIS STUDY ADDS

⇒ Cataract surgical rates were slightly higher in women than in men, but this does not translate to gender equity in eye health services.

⇒ Older women in southeast Nigeria are more likely to access cataract surgery through outreach services.

⇒ Many elderly women may not be accessing cataract surgical services.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ This study has implications for planning equitable cataract services. Interventions designed to overcome barriers to access that are feasible, acceptable and cost-effective need to be identified and evaluated, particularly for older women and cataract surgical services need strengthening.

INTRODUCTION

In 2020, 15.2 million people globally were estimated to be blind from cataract, and a further 78.8 million were moderately or severely visually impaired.[1] Over 90% of these individuals live in low-income and middle-income countries (LMICs).[2] In high-income countries, rapid advances in cataract surgical techniques and technologies have improved patient safety and surgical outcomes and increased demand. In these settings, cataract surgery is one of the most frequently performed surgical procedures and is highly cost-effective.[3]

More women are blind or vision impaired than men in all world regions, and the gap is projected to increase.[2] This gender disparity can be partly attributed to women living longer than men, but women also have lower access to eye care. In the Nigerian national survey of vision impairment and blindness, cataract blindness was twice as high in the Southeast zone (OR 2.14) than in the Southwest, where the former capital, Lagos, is situated.[4] The survey also showed that the prevalence of cataract blindness in women was almost twice that in men (2.2% vs 1.3%, respectively) and was almost five times higher among rural, non-literate women (particularly widows), than among urban, literate men.[4 5] Hence, in Nigeria, to be equitable, two-thirds of cataract operations need to be performed on women.[5]

Table 1 Variation in cataract surgical rate by State and over time in Nigeria

State	Geopolitical zone	Cataract operations/million population/year	
Kwara[13]	Northcentral	218 in 2003	1020 in 2009
Sokoto[14]	Northwest	272 in 2006	596 in 2014
Ogun[15]	Southwest	–	1098 in 2014

Cataract surgical rate (CSR), defined as the number of cataract operations performed per million population per year in a defined geographical location, is an indicator of the output of cataract surgical services.[6] CSRs vary greatly between and within countries, ranging from 5 000 to 10 000/million per year in high-income countries to less than 500/million in sub-Saharan Africa.[7 8] In China and India, the CSR is estimated to be above 10 000/million/year.[9 10] In 2000, the WHO set a CSR target of 1000/million for African countries.[11] As the global population ages, more people will develop age-related cataracts and will require sight-restoring surgery. The WHO target for Africa may need to be revised upwards to accommodate these demographic changes. In Nigeria, the most recent national estimate is 309,[12] but CSRs vary by state and may be increasing over time.[13–15] For example, in 2003, the CSR in Kwara state in North-central Nigeria was 218 which increased to 1020 in 2009 (table 1). Most studies from Nigeria do not address sex differences in access to cataract surgery.

In Nigeria, cataract surgery is provided by government, private and faith-based facilities. In all types of facility, patients are charged for surgery. Costs are highest in the private sector and lowest in the government sector, but waiting times for surgery are longer in government facilities. In some facilities patients identified during outreach are transported to the hospital and have subsidised or free cataract surgery.[16] The aim of this study was to assess the CSR and gender differences in CSR in Imo state, Southeast Nigeria.

METHODS

This was a retrospective review of health facility records of cataract surgery in Imo State in 2019. The study adhered to Strengthening the Reporting of Observational Studies in Epidemiology guidelines for reporting observational studies in epidemiology.

Imo State had an estimated population of 5.41 million in 2016 (49% women), almost 30% of the population live below the poverty line, most are subsistent farmers and approximately 25% are not literate.[17 18]

Sampling frame and recruitment

A list of all facilities (state, faith-based and private) delivering eye care was obtained from the state Ministry of Health. The list was cross-checked by the state coordinator, Ophthalmological Society of Nigeria. Inclusion criteria were any health facility or outreach centre licensed to perform cataract surgery. In each facility, the head ophthalmologist was contacted by telephone and emailed the information sheet and consent forms as part of our invitation to participate.

Data collection

All consenting facilities were sent a data extraction form in Microsoft Excel (online supplemental file) and the principal investigator (AEA) trained local ophthalmologists to extract data from theatre records for the year 2019 and to complete the Excel file. The year 2019 was chosen as it was the most recent year reflective of the pre-COVID-19 era. For each facility, data were collected on its location (urban/rural), type (government, private or faith based), availability of cataract surgery and the number of cataract operations conducted in 2019. Individuals less than 18 years were excluded. Age was stratified into older (65+ years) and younger (18–64 years). For each patient, the following data were extracted: urban/rural place of residence, entry point (outreach or health facility), age (years), sex and surgical technique (phacoemulsification, small incision surgery, extracapsular cataract extraction). Patients' initials were extracted to deidentify the data, and each patient was assigned a unique ID which included a code for each eye hospital. The data were cleaned in Excel and then transferred to STATA V.15 (StataCorp) for analysis.

Projected population data for Imo state by sex (2016) were obtained from the National Population Commission.[19]

Analysis

We calculated the CSR overall and by sex. Tests of significance for differences in mean age, and CSR in men and women were performed using the two-sample t-test and z-statistic, respectively. We compared CSRs in men and women, and in younger and older women. The level of significance was set at 0.05.

Patient and public involvement

Patients and the public were not involved in the planning, design, conduct or reporting of this study. However, a summary of the findings will be shared with the state eye care policy-makers and stakeholders, such as local ophthalmologists, to aid in planning equitable cataract services.

RESULTS

11 eye centres were licensed to deliver cataract surgery in 2019. Six were in urban areas and five in rural areas; five were privately owned, two were faith based and four were government hospitals. Only six facilities (55%) performed cataract surgery; three were in urban areas and three were government hospitals. Two facilities (one government and one faith based) provided outreach services within the state and all surgeries were performed at the base hospital. Five facilities did not provide surgery due to the lack of a surgeon or other human resources

Table 2 Cataract operations in Imo State in 2019, by facility type and location, sex and entry point

Facility code	Type of facility	Location of facility	Total cataract surgeries	Sex		Entry point	
				Male	Female	Outreach	Facility
				n (%)	n (%)	n (%)	n (%)
1	Government	Urban	100	57 (57.0)	43 (43.0)	59 (59.0)	41 (41.0)
3	Government	Rural	71	34 (47.9)	37 (52.1)	–	71
4	Government	Urban	274	138 (50.4)	136 (49.6)	–	274
5	Faith-based	Rural	1256	599 (47.7)	657 (52.3)	175 (13.9)	1081 (86.1)
6	Private	Urban	21	13 (61.9)	8 (38.1)	–	21
7	Private	Urban	65	27 (41.5)	38 (58.5)	–	65
Total			1787	868 (48.6)	919 (51.4)	234 (13.1)	1553 (86.9)

(n=4) or theatre reconstruction (n=1). The odds of an eye centre performing cataract surgery were higher for centres in urban areas (OR 2.99, p=0.37) and for government hospitals (OR 4.0, p=0.3).

A total of 1787 cataract surgeries were performed on adults during the study period (table 2). Age data were missing for 101 patients (52 women) and the mean age of those with data (n=1686) was 64.5 (SD±12.0) years. The mean age of males (65.4 years) was 1.8 years higher than in females (63.6 years; p=0.002). More women (51.4%, n=919) underwent cataract surgery than men (n=868; table 2). However, this was not statistically significant (p=0.2).

Most surgery was conducted in rural hospitals (1327, 74.3%), but there was no association between sex and hospital location (OR=1.14, p=0.2). One faith-based hospital performed 70% of the operations.

Data on the place of patient's residence (rural/urban) were only available in one facility. Most patients (86.9%) accessed cataract services via health facilities; the minority were identified through outreach and taken to the base hospital for surgery. More elderly women (≥65 years) than men accessed cataract surgery through outreach (figure 1) (OR 1.5, 95% CI 1.03 to 2.22, p=0.03), and older women were more likely to have accessed cataract surgery through outreach than younger women (OR 1.6, 95% CI 1.07 to 2.44, p=0.02).

The most common surgical technique (90.7%) was small incision cataract surgery (SICS), and phacoemulsification surgery was performed more often on men than women (p=0.24) (table 3).

The CSR in 2019, using population projections for 2016, was 330/million (table 4). The CSR was 10% higher in women (347/million) than in men (315/million) (p<0.001).

DISCUSSION

In 2019, 1787 cataract operations were conducted in Imo state and just over half were performed on women. The overall CSR was estimated to be 330/million, which is less than a third of the recent CSRs in other states in Nigeria,[13 15] and lower than the target for Africa of 1000 which was set more than 20 years ago.[11] Other countries in SSA have reported higher CSRs, for example, 1016 in Mali and 1993 in The Gambia, or lower CSRs, for example, 163 in the Republic of Congo and 197 in Uganda.[12] In our study, almost one in eight patients were initially identified during outreach, without which the CSR would only be 288/million/year. Our results indicate that the CSR in Imo State is low and needs to

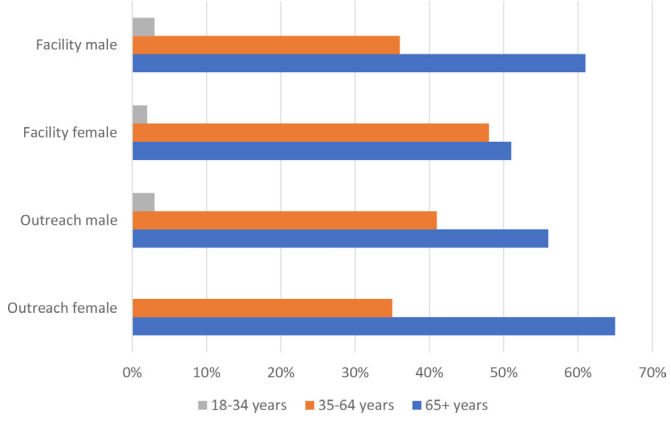

Figure 1 Age and sex of patients accessing cataract surgery through outreach and facility in Imo state, Nigeria.

Table 3 Type of surgery performed In Imo State, Nigeria in 2019 by sex

Type of cataract surgery	Male	Female	Total
	n (%)	n (%)	n (%)
Small incision	782 (90.1)	839 (91.3)	1621 (90.7)
Extracapsular extraction	37 (4.3)	33 (3.6)	70 (3.9)
Intracapsular extraction	0 (0)	1 (0.1)	1 (0.1)
Phacoemulsification	33 (3.8)	24 (2.6)	57 (3.2)
Small incision plus trabeculectomy	0 (0)	2 (0.2)	2 (0.1)
Not stated	16 (1.8)	20 (2.2)	36 (2)
Total	868 (100)	919 (100)	1787 (100)

Table 4 Cataract surgical rate overall and by sex

	Population (2016)	Number of cataract operations in 2019	Cataract surgical rate
Sex			
Male	2 758 466	868	315
Female	2 650 290	919	347
Total	5 408 756	1787	330

be increased and highlights that outreach may play an important role, particularly for older women.

The CSR in women (347/million) was 10% higher than in men (315/million). This is the first study in Nigeria to report a higher CSR in women than men. Several other studies report cataract surgical coverage (CSC), a population-based indicator of access to surgery, disaggregated by gender,[20–23] and studies from Kenya[24] and Argentina[25] report higher CSCs in women. In contrast, the Nigerian national blindness survey showed a higher CSC in men.[5] In a review of 20 Rapid Assessment of Avoidable Blindness surveys, the CSC was lower in women in half of the countries.[26] The higher CSR among women in our study may reflect the higher prevalence of cataract blindness in women than men. However, the sex difference disappears when patients accessing services via outreach are excluded, highlighting the importance of this approach for elderly women in this setting. Studies on outreach in Nigeria have inconsistent findings in relation to the proportion of men and women identified with operable cataract and the proportion subsequently undergoing surgery. Differences may be explained by the timing and location of the outreach, and whether transport to base hospitals and subsidised surgery are offered.[27–29]

To overcome gender inequity in cataract blindness in Nigeria, two-thirds of cataract surgery would need to be undertaken on women,[5] but in our study, just over half the surgery was on women. In many LMICs, women are less likely to undergo cataract surgery due to socioeconomic and cultural barriers they face, for example, less access to funds, fear of surgery, fatalistic beliefs, lack of an escort and low levels of education and agency.[5 16] Strategies to increase CSR include targeted health promotion for elderly persons or cataract detection at primary healthcare facilities. Operational research and intervention science research are needed to identify interventions which increase access, as there is limited evidence of what works well and for whom in LMICs.[19]

An unexpected finding was that males who underwent cataract surgery were significantly older than women which does not reflect the age structure in Nigeria.[30] Women live longer and are at greater risk of becoming visually impaired from cataract,[2 31] hence, the expectation is that women with operable cataract would be older than men. A plausible explanation for our findings is that older women with cataracts are not accessing eye care services. However, age data were not available for 101 patients. If elderly women were less likely to know or reveal their age than men, this would bias the findings. A limitation of the study was that data were not collected on whether the outreach services provided transport to the base hospital, or whether the costs of surgery were lower for patients identified during outreach as both are key factors in accessing care.[16 32 33]

Triangulating these findings suggests limited access to cataract surgical services, particularly by elderly women. A coordinated, evidence-based approach is necessary to address this as well as gender inequity in cataract services. This could include engaging communities to identify workable solutions to barriers to accessing cataract surgery, particularly among poor, elderly women. Strategies could include outreach targeting elderly women, eye health advocacy, health insurance which target women's groups, providing community escorts and scaling up primary eye care. Concerning the latter, the Ministry of Health in Nigeria has recently included the WHO AFRO primary eye care training package in primary healthcare workers' curricula. It is expected that this initiative will improve access to eye care for marginalised populations, particularly women and people living in rural and underserved urban areas.[34]

The most common procedure for cataract extraction was manual SICS (MSICS) with intraocular lens insertion. Phacoemulsification, which is as effective as MSICS, is more expensive, which may explain why more men than women underwent this procedure.

In our study, a lack of human resources was the main reason why almost half (5/11) of the facilities in Imo State licensed to perform cataract were not doing so. Human resources for eye health (HReH) are essential for eye health service delivery.[35] A review of HReH in sub-Saharan Africa found that few countries achieved the suggested targets for ophthalmologists, ophthalmic nurses, optometrists/refractionists and clinical officers.[36 37] To improve access to cataract surgery in Imo state, there is a need to address the challenges faced by the five ophthalmic centres not providing cataract services, and to increase the capacity of those currently doing so. The recently launched National Eye Health Policy (NEHP) aims to standardise and equip one secondary level eye unit per million population, including high output, high-quality cataract surgery and to develop competent and capable eye health teams and eye health managers to manage common eye diseases, particularly cataract.[38] If appropriately implemented, the NEHP may address the supply-side challenges of eye health in Nigeria.

The findings of this study should be interpreted with caution as it does not include people who may have accessed cataract surgery in neighbouring states or elsewhere. Patients who live in other states may also have been included. The latter is unlikely, as visually impaired patients are likely to access services near where they live. In addition, all the outreach in the state was led by centres within the state. A more representative metric would be CSC from a population-based survey.

A strength of this study is that all cataract surgeries performed in all the active ophthalmic centres were included, and to the authors' knowledge is the first study in Africa to report CSR by sex. A limitation is that the hospitals did not all record the data required and some data were missing, such as age. Another factor to consider is that the CSR indicator was developed to assess the surgical output of facilities and does not take into account whether one or both eyes of patients are operated on during the same year, that is, CSR is not a person-level indicator. In this study, if more men than women had surgery on both eyes in 2019, sex differences at the person level would increase the sex differences.

CONCLUSION

Our study shows that the overall CSR in Imo state in 2019 was lower than recommended for sub-Saharan Africa and, although the CSR was slightly higher in women than in men, it was still inequitable. Studies are needed to address the demand for cataract surgery, particularly operational research and intervention science, to identify and evaluate interventions which increase access to cataract surgery, particularly for elderly women. Future studies could also investigate the visual outcomes, effective CSC and costs of cataract surgery in the state. Implementation of the NEHP plans to strengthen cataract surgical services would go a long way to address current supply-side limitations in the state.

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