IJHR

Available at http://www.ijhr.org
ISSN:1596-9886

Open Access
Peer-reviewed Journal

Original Research Article

Evaluation of Post-Operative Visual Outcomes of Cataract Surgery in Ghana

Alex A Ilechie[1], BS Boadi-Kusi[1], OV Ndudiri[2], EA Ofori[1]
[1]Department of Optometry, University of Cape Coast, Ghana; [2]Department of Internal medicine, Effia Nkwanta Regional Hospital, Sekondi

***For correspondence**: Email:* drilechie@yahoo.com

International Journal of Health Research 2012 March; 5(1): 35-42

Abstract

Purpose: To evaluate post-operative visual outcomes after cataract surgeries performed at 2 tertiary referral hospitals in Ghana

Methods: A retrospective consecutive case review of hospital –elective-cataract surgeries of all ages performed at two tertiary referral centers in Southern Ghana during a 3-year-period was carried out. Data was compiled on demographic characteristics, pre- and postoperative visual acuities and surgical complications. The preoperative and postoperative visual status was classified using the World Health Organization (WHO) category of Visual Impairment and Blindness. The standard parameters of assessing outcome of cataract surgery and the WHO criteria for grading the outcome of cataract surgery were used.

Results: A total of 1288 unilateral cataract extractions were performed within the 3-year-period of this review. Mean age of the patients at operation was 64.47 ± 16.7years. Small incision cataract surgery (SICS) with intraocular lens implant (83.8%) was the major surgical technique. One thousand two hundred and eighty four eyes (99.7%) were blind (VA <3/60) before surgery of which fewer than 9.5% remained blind postoperatively. The proportion of post operative eyes with good outcome (6/6-6/18) was 22.0% within 48 hours of surgery and 41.2% at 4-6 weeks follow up. Outcome was poor (<6/60) in 29.2% within 48 hours of surgery and 9.5% at 4-6 weeks follow up. Nearly half of the operative eyes had borderline outcome (6/24-6/60) within 48 hours of surgery and at follow up. ECCE +IOL operating technique achieved the best results, resulting in 54.6% of the operated eyes achieving good outcome. Only 2.8% of the operated eyes had surgical complications at follow up, of which posterior capsular opacities (50%) and vitreous loss (13.3%) were the major causes. A total of 1164 (90.4%) of the operated eyes did not have optical correction after surgery.

Conclusion: Over 41.2% of post-operative eyes patients in this study had very good visual outcome following cataract surgery in the study population. Nevertheless, greater attention to post-operative care and uncorrected refractive error is needed.

Keywords: Cataract surgery, cataract surgical outcome, visual outcome.

This article is available in Embase, Index Corpenicus, Scopus, PubsHub, Chemical Abstracts, Socolar, EBSCO, African Journal Online, African Index Medicus, Open-J-Gate, Directory of Open Access Journals (DOAJ) databases

***Editorial Office:** College of Medicine, Madonna University, Elele Campus, Rivers State, Nigeria Email: editor@ijhr.org*

Introduction

Cataract is the leading cause of blindness globally and is particularly common in sub-Saharan Africa including Ghana[1, 2]. A recent report from Vision 2020 estimated that 100,000 cataract blind people live in Ghana [3] and another population-based study in Ghana found prevalence of cataract to be as high as 53.9% in 40years and older [4]. Cataract surgery is the only method of restoring vision for those with vision impairment due to cataract and it is the second most cost effective public health intervention following immunization to prevent communicable diseases [5].

In addition to increasing cataract surgery rates, it is important that high quality of cataract surgery be maintained to achieve targets related to the Vision 2020 initiatives [6]. Performing surgical audits is one of the methods of quality control [7]. To assess quality of cataract surgery, indicators like the visual outcome is crucial both for the clients and for the eye care provider. Good surgical outcomes are essential in relieving volumes of cataract blindness by promoting cataract surgery to the people. Poor outcomes experienced by patients following surgery will affect the demand for cataract surgery by the community and have a negative impact on people's perception of cataract surgery [8]

Visual outcome of cataract surgery is measured either as visual acuity in the operated eye or in the patient, in terms of ability to function, quality of life, or economic rehabilitation. The outcome can be assessed with full spectacle correction ('best visual acuity') or with presenting vision. Good outcome is defined as 6/6 – 6/18 (available and best correction grades = >85% and >90%) respectively), borderline outcome as <6/18 – 6/60 (available and best correction =<15% and <5% respectively), and poor outcome as <6/60 (available and best correction =<5% for each type) [9]. When assessing the vision restoration benefits achieved through cataract surgery, the measurement of visual acuity with the presenting correction, if any, not best corrected measurement, is what counts because presenting vision represents the actual circumstances under which people function in day-to-day activities [10].

In many parts of the world much more attention is being given to the quality of cataract surgery with the aim of improving the post-operative visual outcome. Recent population-based surveys in several developing countries have shown that 40-75% of post-operative eyes have a presenting visual acuity worse than 6/18, with as many as 50% worse than 6/60 [11-14]. Growing concerns exists over the outcomes of cataract surgery in Ghana. To fill this gap, we present a retrospective study of outcome of consecutive cataract surgeries performed by experienced ophthalmologists, during a 3-year period, at two tertiary referral centers in urban Southern Ghana.

Methods

Study Setting

The study was conducted at the Korle-Bu Teaching Hospital (KBTH), Accra and Our Lady of Grace Hospital (OLGH), Breman-Asikuma. These centers are tertiary health care facilities located in the Greater Accra Region and Central Region of Ghana respectively and serve as major referral centers in these regions. They are engaged in provision of tertiary health care services, undergraduate and post graduate medical and paramedical training, and research. Both clinics started to perform cataract surgery over two decades ago. At these centers the ophthalmology department delivers promotive, preventive, curative, and rehabilitative eye care services through outpatient and inpatient care. The eye care work force at the eye centers consists of ophthalmologists-consultants and trainees, optometrists, and ophthalmic nurses equipped to undertake both elective and emergency surgeries. The anesthetic staffs work on schedule from their parent department of anesthesia to handle both elective and emergency surgical cases requiring general anesthesia. Local anesthesia, which is more frequently utilized, is administered by the ophthalmologists who are mandatorily trained on that during their residency programmes. An average of 20 and 15 cataract surgeries respectively are carried out every week in the ophthalmology departments' of KBTH and OLGH.

Clinical Procedure for Attending to Cataract Patients

Surgical schedule are prepared by the ophthalmic nurses according to the convenience of the surgeons. A pre-operative evaluation of the health of the interior of the eye was carried out prior to the cataract surgery. This evaluation has important prognostic importance and is carried out on every patient scheduled for cataract surgery. Also biometric measurements were carried out on each patient before surgery to determine the required dioptric power of the intraocular lens (IOL) to be chosen. In cases when it was not possible to obtain such measurements, fellow eye refraction was used to help determine the required IOL. Operations on cataract patients are carried out under operative microscope and using standard microsurgical techniques. Operated patients were assessed on a slit-lamp biomicroscope 48 hours after surgery or on the fourth day at most, at which time the presenting vision was assessed, and finally are routinely followed up at 4weeks and after 6 weeks of surgery. At follow ups, the operated eye was examined for operative complications and presenting vision was recorded.

Study Design

Following ethical approval using a retrospective study design, we reviewed the outpatient records of hospital elective cataract surgeries of all ages at the two centers from January 1, 2008 through December 31st 2010 to determine the following: age category (senile > 50 years), pre-senile (21 – 50 years), juvenile (< 21 years), gender, type of surgical technique performed, preoperative and post operative visual acuity (visual outcome at 48 hours after surgery, and at 4-6 weeks follow up), surgical complications, and spectacle visual acuity (visual outcome of patients who had refraction after surgery) if any. Emergency cases, complicated and traumatic cataracts and cataract combined with glaucoma, cornea emergency or vitreo-retinal procedure were excluded. Also excluded are records of patients with cataract associated with hypertension or diabetic mellitus. The preoperative and postoperative visual status of each patient was classified using the World Health Organization (WHO) category of Visual Impairment and Blindness [16]. Levels of visual acuity after cataract surgery were categorized using the WHO recommended guidelines [9]. Early complications of surgery of interest were identified as those clinically evident events which occurred during the operation, within 48 hours of surgery. Late complications considered were only those surgical related complications occurring within 4-6 weeks of surgery, which were sight threatening events necessitating a hospital clinical assessment and further management. We did not collect information on risk factors that are related to poor outcomes because they were either not properly recorded or were missing on the case notes. Data was collected using pre-tested and validated data collection format.

Outcome Measure

The main outcome variable of interest was Snellen's presenting visual acuity after cataract surgery measured at the follow up starting from at least 4 weeks after the surgery. This is the minimum time frame for complete recovery when surgery related changes in eye tissues (edema) disappear and sutures are removed[17].

Data analysis

The data were entered into Microsoft Excel worksheet (Microsoft Inc, USA). Using descriptive statistics (means, proportions, and frequencies distributions), data collected were analysed using Statistical Package for Social Sciences Software (SPSS 16).

Results

A total of 1288 hospital elective cataract surgeries were performed at both centers during the 3-year-review period. All were unilateral cataract extractions. Majority (82.6%) were senile patients. Over 83.8% of the patients had surgery performed by small incision cataract surgery (83.8%) with IOL (SICS+ IOL) method. One thousand two hundred and eighty four eyes (99.7%) were blind (VA<3/60) before surgery of which fewer than 9.5% remained blind after

Table 1: Descriptive Characteristics of Patients

Characteristic	Frequency (%)
Juvenile	38 (3)
Pre-senile	185 (14.4)
Senile	1065 (82.6)
Mean ± SD (years)	64.47 ±16.7
Range (yr)	6-101
Pre-operative VA	
6/6 to 6/12	0
6/18 to 6/60	4 (0.3)
<6/60 to 3/60	0
<3/60	1284 (99.7)
Post-operative VA	
No follow up	21 (1.6)
6/6 to 6/18	522 (40.5)
6/24 to 6/60	625 (48.5)
Less than 6/60	120 (9.5)
Spectacle VA	
No spectacles	1164 (90.4)
6/6 to 6/12	115 (8.9)
6/18 to 6/60	9 (0.6)
Less than 6/60	0
Surgical Technique	
SICS+IOL	1079 (83.8)
ECCE+IOL	175 (13.6)
SICS+NO_IOL	26 (2)
ECCE+NO_IOL	3 (0.2)
ICCE	5 (0.4)

SD=Standard deviation; Min= Minimum; Max= Maximum; VA= Visual acuity; SICS= Small incision cataract surgery; ECCE= Extra capsular cataract surgery; ICCE= Intra capsular cataract surgery

surgery. The descriptive characteristics of the patients studied are provided in Table 1.

Visual Outcome after Cataract Surgery

Table 2 presents the visual outcome at 48 hours after surgery and at 4-6 weeks of follow up. Of the 1254 operated eyes with IOL, 278 (22.2%) eyes had good visual outcome (6/6-6/18) while poor outcome (<6/60) was seen in 360 operated eyes (28.7%). nearly 50% (616) of the operated eyes with IOL had borderline outcome (6/24-6/60) 48 hours after surgery.

One thousand, two hundred and thirty three eyes (97.3%) were examined 4-6 weeks after surgery while 21 (1.6%) were lost to follow up and were excluded from the data analyzed. Of the 29.2% that were blind at discharge, only fewer than 9.5% remained blind at 4-6 weeks follow up. It shows that, 1147 eyes (90.2%) that were either blind or severely visually impaired before surgery were restored to functional vision at 4-6 weeks review.

Of the eyes with IOL which were reviewed, 42% had good outcome, 49.2% had borderline outcome, and outcome was poor in 8.8%. Of the eyes without IOL that turned up for follow up

Table 2: Visual outcome of Cataract Surgery by Type of Surgery

Type of surgery	Visual Acuity by WHO Classification No. of patients (%)			Total (%)
	Good (6/6-6/18)	Borderline (6/24-6/60)	Poor (<6/60)	
48 hours after Surgery				
SICS+IOL	232 (21.5%)	533 (49.4%)	314 (29.1%)	1079 (83.8)
ECCE+IOL	46 (26.3%)	83 (47.4%)	46 (26.3%)	175 (13.6%)
SICS+NO IOL	3 (11.5%)	9 (34.6%)	14 (53.9%)	26 (2.0%)
ECCE+ NO IOL	1 (33.3%)	2 (66.7%)	0 (0.0%)	3 (0.2%)
ICCE	1 (20.0%)	2 (40.0%)	2 (40.0%)	5 (0.4%)
TOTAL	283 (22.0%)	629 (48.8%)	376 (29.2%)	1288 (100.0%)
At 4-6 weeks follow up				
SICS + IOL	422 (39.8%)	545 (51.5%)	92 (8.7%)	1059 (83.6%)
ECCE + IOL	95 (54.6%)	62 (35.6%)	17 (9.8%)	174 (13.7%)
SICS +NO IOL	3 (11.5%)	13 (50.0%)	10 (38.5%)	26 (2.0%)
ECCE+NO IOL	1 (33.3%)	2 (66.7%)	0 (0.0%)	3 (0.2%)
ICCE	1 (20.0%)	3 (60.0%)	1 (20.0%)	5 (0.4%
TOTAL	522 (41.2%)	625 (49.3%)	120 (9.5%)	1267 (100.0%)

(n=34), outcome was good in 14.7% of eyes, borderline in 53%, and poor in 32.4%. Over 50% (607) of the operated eyes with IOL had borderline outcome after 4-6 weeks of follow up.

Types of Surgical Complications

Both early and late surgical complications were recorded in the case notes (Table 3). Early surgical complications occurred in only 130 (10.1%) eyes. The most common early post operative complication that occurred in 44 (3.4%) eyes was cornea edema which occurred in 37 (2.9%) of SICS+IOL cases, 6(0.5%) cases of ECCE+IOL and 1 (0.1%) case of SICS without IOL. Hyphema was the second most common early complication which occurred in 2.2% (28) eyes; 1.2% of SICS+IOL, 0.8% of ECCE+IOL and 0.1% of SICS with no IOL.

Late Surgical Complications

Late surgical complications occurred in 36 (2.8%) eyes with posterior capsule opacification as the most common late surgical which occurred in 18 eyes (1.4%); (1.1%) cases of SICS+IOL and 3 (0.2%) cases of ECCE+IOL. Following posterior capsule opacification was vitreous loss which occurred in 6 (0.5%) eyes; 3 (0.2%) cases of SICS+IOL, 2 (0.2%) cases of ECCE+IOL and 1 (0.1%) case of SICS without IOL. Macula edema (0.4%) occurred only in SICS+IOL eyes.

Discussion

This study has shown that cataract is an important cause of blindness in Ghana and cataract surgery could result in good outcome in 42% of operated eyes. In previous studies in Nigeria[18] and India [19], 85.8% and 94.8%, respectively of the operated eyes were blind before surgery. Given the number of eyes that were cataract blind before surgery (99.7%) in the present study, the proportion of eyes with good outcome in the present study might be justified compared to the audit of Isawumi et al[20] and Ashaye et al [21], both in Western Nigeria which showed 47.5% and 40.2% good outcome respectively with fewer number of cataract blind eyes than ours, and slightly better than the 37% and 35.4% for good outcome independently reported by Alhassan et al[18] and Ezegwui and colleagues[22] from two tertiary referral centers in Nigeria. In contrast, these proportions are much lower than the 92% good outcome of Norregaard and colleagues [23] consolidated data from the US, Canada, Denmark and Spain. This could in part be explained by differences in quality of eye care service between the developed and developing countries and the different design of studies. While the present study shares similarity in design with previous studies in Nigeria[18,20-22,], Norregaard and colleagues[23] compared functional outcomes after cataract surgery performed at 4 different high income countries using a self-reported measure of visual function (Visual Function Index, VF-14) which may have contributed to the sharp contrasts in rates with our study. An earlier experience in Ghana[24] recorded a much higher rate of 53% good outcome, although the number of patients included in that study was much lower than ours.

Table 3: Surgical Complications (N=1288)

Variable	Frequency (%)
Early surgical complications	
No of complications	1158 (89.9)
Cornea oedema	44 (3.4)
Hyphema	28 (2.2)
High IOP	19 (1.5)
Conjunctival injection	9 (0.7)
Iridodialysis	6 (0.5)
Dislocated IOL	5 (0.4)
Striate keratitis	5 (0.4)
Posterior synaechia	4 (0.3)
Anterior capsule tear	3 (0.2)
Iritis	3 (0.2)
Vitrous haemorrhage	2 (0.2)
Subconjunctival haemorrhage	1 (0.1)
Punctate keratitis	1 (0.1)
Late surgical complications	
No of complications	1252 (97.2)
Posterior caps opacification	18 (1.4)
Vitreous loss	6 (0.5)
Macular oedema	5 (0.4)
Band keratopathy	1 (0.1)
Cornea dystrophy	1 (0.1)
Corneal edema	1 (0.1)
Dislocated IOL	1 (0.1)
Hyphema	1 (0.1)
Total hyphema	1 (0.1)
Trauma to the eye	1 (0.1)

Most (97.4%) of the operations were done with IOL implants. This is appropriate since visual rehabilitation following cataract surgery is known to be better with IOL than with aphakic spectacles [19]. In this study, ECCE +IOL operating technique achieved the best results, resulting in 54.6% of the operated eyes achieving good outcome. Several studies conducted worldwide indicated that currently used techniques of cataract surgery vary by their visual outcomes[25-28]. Phacoemulsification and SICS have been shown to be the most effective techniques of cataract surgery with regards to visual outcome, followed by ECCE. ICEE is now a very unusual surgical technique for cataract surgery due to its poor visual outcomes [26, 29].

Based on the WHO benchmark of 5% for poor outcome of cataract surgery[9], the 9.5% for poor outcome in our study is significantly high. However, when we consider only the eyes with IOL, outcome was poor only in 8.8% operative eyes. In general, the outcome of cataract surgeries is often not optimal especially in Africa and Asia[30-32]. Poor visual outcome following ECCE with IOL implant have been reported in 9.7-15.5% of operated eyes in hospital-based studies in Nigeria[18,22,33] However, the fact that duration at discharge and duration of last operation visit was not standardized makes comparison across studies difficult. The majority of the poor outcome was caused by posterior capsular opacity (1.4%) and vitreous loss (0.5%), similar to the findings of Alhassan et al[18] and Isawumi[20]. Other African countries have reported a much higher incidence of posterior capsular opacity of 11.4% in Sierra Leone [34], 5.17% in Ethiopia[35] and 6.28% in Nigeria[22]. In developing countries large number of hypermatured and Morganian cataracts are encountered, this combined with the recognized weaker zonules of hypermature cataracts, contributes to the greater risk of posterior capsule defects and vitreous loss [36].
One of the most striking findings in this study was the number of pseudo aphakes with residual refractive errors yet were not wearing spectacle corrections (90.4%). Although we were unable to ascertain whether they had undergone refractive examinations or the cause of noncompliance to spectacle correction because of the retrospective nature of this study, this underscores the need for more precise IOL power estimation before operation and better optometric examination and spectacle provision should be ensured to maximize surgical benefits. The vision improvement that could be gained by adequate postoperative refractive correction has been highlighted in most studies [12,13,17] . The difference in visual outcomes with and without optical correction in several studies brings attention to the fact that residual refractive error is a major barrier to successful outcomes. It is possible that most of the operated eyes could have had improved outcome with best correction. Emphasis therefore, should be placed on proper monitoring of aphakic and pseudo-aphakic patients for correction of post operative refractive errors. Further studies are recommended in this area.

The proportion of post-operative surgical complications in the present study was generally low (2.8%) compared to the 16.41% and 28.5% reported by Isawumi[20] in Western Nigeria and Haileselassie[35] in Ethiopia respectively. This may be due to the fact that the operations in our series were mostly SICS +IOL. Improved outcome in the operated eye with SICS + IOL implantation has been mentioned in various reports [37, 38].

In general, the findings from hospital based studies of visual outcome of cataract surgery need to be interpreted with caution since patients who come back for routine follow up may not represent all those who had surgery. For example, patients with poor outcome may not be more likely to attend for follow up at the same facility than those with good outcome who are pleased with the visual result. Therefore, our findings should be interpreted with care.

Conclusion

There is a potential for excellent surgical outcome in Ghana if more attention is paid to PCO and uncorrected refractive error. The study highlights the need for improved post-operative visual monitoring after cataract surgery in Ghana. Further studies of a larger sample size and taking into consideration risk factors that are related to poor outcome are recommended.

Conflict of interest

No conflict of interest associated with this work.

Contribution of authors

The authors declare that this work was done by the authors named in this article and all liabilities pertaining to claims relating to the content of this article will be borne by the authors.

References

1. Foster A. Who will operate on Africa's 3 million curable blind people? *Lancet* 1991; 337: 1267-9
2. Yorston D. Ophthalmology review. *Africa Health*. March 2000: 25-26.
3. Ghana Eye Foundation: The Concept.[updated 2011 August 12; cited 2011 September 14] Available from http://www.ghanaeyefoundation.org/private content/File/GEFOUND% 20Conception.pdf
4. Guzek J P, Anyomi F K, Fiadoyor S, and Nyonator F. Prevalence of Blindness in People Over 40 Years in the Volta Region of Ghana. *Ghana Med J 2005*; 39(2): 55–62.
5. Limburg H, Foster A, Vaidyanathan K, Murthy GV. Monitoring visual outcome of cataract surgery in India. *Bull World Health Organ 1999*; 77:455-460.
6. Foster A. A simple method for evaluating surgical cataract services in prevention of blindness programmes. *Comm Eye Health* 1992; 10: 2-5
7. Assessment of visual gain following cataract surgeries in Oman: A Hospital-Based Cohort Study: *Oman Med J* 2009, 24 (1): 11-6
8. Foster A. Cataract and Vision 2020-the right to sight initiative. *Br. J. Ophthalmol*. 2001, Jun; 85(6):635-7
9. Vision 2020. The right to sight 2007. Global Initiative for elimination of avoidable blindness: action plan 2006 – 2011. World Health Organization, Geneva, 2007.
10. Leon BE. Cataract Surgery Outcomes: a priority agenda item. *J Comm Eye Health* 2000, 13 (35):33-34
11. Welsh NH: Extracapsular cataract extraction with and without intraocular lens implantation in black patients. *S Afr Med J* 1992; 81: 357-60
12. Rokharel GP, Selvaraj S, Ellwein LB. Visual functioning, quality of life outcomes between cataract operated and un-operated blind populations in Nepal. *Br. J. Ophthalmol* 1998, 82: 606-10
13. He M, Xu J, Li S, Wu K, Munoz SR, Elwein LB. Visual acuity and quality of life in patients with cataract in Douman County, *China Ophthalmology* 1999, 106: 1609 -15.
14. Dandona L, Dandona R, Nadavilath T J. Population-based assessment of the outcomes of cataract surgery in an urban population in Southern India. *Am. J. Ophthalmol* 1999, 127: 650-58.
15. Biostatistics Modeling and Sampling. Course Notes. American University of Armenia, Master of Public Health Program 2008.
16. WHO (2006). World Health Organization. ICD -10 updates 2006. World Health Organization: Geneva. Available from http://www.who. int/blindness/en/. [updated 2011 June 14; cited 2011 September 14]
17. Hennig A, Johnson G, Evans J: Long term clinical outcome of a randomized controlled trial of anterior chamber lenses after high volume intracapsular cataract surgery. *Br J Ophthalmol* 2001; 85: 11-17
18. Alhassan BM, Kyari F., Achi BI, Ozemela PC., Abiose A: Audit of outcome of an Extracapsular cataract extraction and posterior chamber intraocular lens training course. *Br J Ophthalmol* 2000; 84: 848-851
19. Kapoor H., Chatteijee A., Daniel R., Foster A. Evaluation of visual outcome of cataract surgery in an Indian eye camp. *Br J Ophthalmol* 1999; 83**:** 343-6.
20. Isawumi MA, Soetan EO, Adeoye AO, Adeoti CO: Evaluation of cataract surgery outcome in Western Nigeria. *Ghana Medical Journal* 2009; 43(4): 169-174
21. Ashaye AO, Komolafe OO: Visual outcome of cataract surgery in University College Hospital, Ibadan, Nigeria. *West Afri. J/ Med*. 2009; 28 (2): 102-105
22. Ezegwui IR, Ajewole J: Monitoring cataract surgical outcome in a Nigerian mission hospital. *Int Ophthalmol* 2009; 29:7-2
23. Norregaard JC, Bernth-Peterson P, Alonso J: Visual functional outcomes of cataract surgery in the United States, Canada, Denmark, and Spain: report of the International Cataract Surgery Outcomes Study. *J Cataract Refract Surg* 2003: 29:2135-2142
24. Egbert PR, Buchanan M.: Results of Extracapsular cataract surgery and intraocular lens implantation in Ghana. *Arch Ophthalmol*. 1991; 109 (12): 1764-1768.
25. Minassian DC, Rosen P, Dart JK. Extracapsular cataract extraction compared with small incision surgery by phacoemulsification: a randomized trial, *Br J Ophthalmol* 2000; 85 (7): 822-9
26. Thomas R, Kuriakose T. Surgical techniques for a good outcome in cataract surgery personal perspectives. *Community Eye Health*. 2000; 13 (35): 38-9
27. Cogate P. Clinical Trial of Manual Small Incision Surgery and Standard Extracapsular Surgery. *Community Eye Health* 2003. Vol. 16 (48)
28. Hennig A, Kumar j, Yorston D, Foster A. Sutureless cataract surgery with nucleus extraction: outcome of a prospective study in Nepal. *Br J Ophthalmol* 2003: 87: 266-270.
29. Gogate PM, Deshpande M, Wormald RP, Deshpande R, Kulkarni SR. Extracapsular cataract surgery compared with manual small incision cataract surgery in community eye care setting in western India: a randomized controlled trial. *Br J Ophthamol* 2003; 87: 667-672
30. Rabiu MM, Mohammed N. Rapid assessment of cataract surgical services in Birnin Kebbi local government

area of Kebbi State, Nigeria. *Ophthalmic Epidemiol* 2008**; 15:** 359-65.
31. Bejiga A, Tadesse S. Cataract surgical coverage and outcome in Goro District, Central Ethiopia. *Ethiop Med J.* 2008; 46(3): 205-10.
32. Lindfield R., Polack S., Wadud Z., Choudhruy KA., Rashid AK., Kuper H. Causes of poor outcome after cataract surgery in Satkhira district, Bangladesh. *Eye* 2008; 22(8): 1054-56.
33. Nwosu SN, Onyekwe LO. Intraocular lens implantation surgery in Onitsha, Nigeria. *Niger J Ophthalmol* 2002; **1:** 5-9.
34. Cook NJ. Evaluation of high volume Extracapsular cataract extraction with posterior chamber lens implantation in Sierra Leone, West Africa. *Br J Ophthalmol* 1996; 80: 698-701
35. Haileselassie T, Asefa Y, Bayu S, Bejiga A. Outcome of extra-capsular cataract extraction with posterior chamber intraocular lens implantation performed at a cataract surgical campaign. *Ethiop J Health Dev* 2002; 16 (1): 77-83
36. Lewallen S, LeMeasurer RT. Extracapsular cataract surgery in developing countries [letter]. *Arch Ophthalmol* 1993; 111: 18-19
37. Lundstrom M, Stenevi U, Thorborn W. Outcome of cataract surgery considering the preoperative situation; a study of possible predictors of the functional outcome. Br J Ophthalmol 1999, 83: 1272-1276
38. Gogate P, Deshpande M, Nirmalan PK. Why do phacoemulsification? Manual small-incision cataract surgery is almost as effective, but less expensive. *Ophthalmol* 2007; 114: 965-968.