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Research Article

Outcome of Age Related Cataract Surgery at Noor Eye Hospital, Kabul- Afghanistan

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Abstract

Objective: The overall objective was to assess the outcome of age related cataract surgery at Noor Eye Hospital, Kabul- Afghanistan. The specific objectives are:

- To determine the visual outcome of age related cataract surgery at Noor Eye Hospital Kabul,
- To determine factors influencing outcome in age related cataract surgery at Noor Eye Hospital Kabul.

Justification: Cataract audit is an essential tool in monitoring quality of cataract surgical services. This study aims at looking at the outcome of age-related cataract surgery in this hospital. In addition, no similar study has been done previously in Noor Eye Hospital and the region at large. Information obtained in this study was used to institute the basis for a prospective monitoring of outcome of cataract surgery in the hospital and the region at large.

Study Design and Study Period: This was a retrospective hospital based case series. The study period was from 15th Feb 2018 to 15th Jun 2018.

Study Population: All patients were over 40 years who underwent cataract surgery at Noor Eye Hospital from 15th Feb 2018 to 15th Jun 2018.

Sampling Method: All patients who underwent cataract surgery at Noor Eye Hospital within the study period and met the inclusion criteria were selected.

Data Collection and Management: Data was collected using questionnaires, analyzed using Acastat and presented in tables and figures.

Ethical Approval: Permission and authority to conduct the study was sought from the Ethics and Research Committee of University of Kabul/Noor Eye Hospital. In Kabul, ethical approval to conduct the study was sought from the Management and Ethics Committee of the Noor Eye Hospital and the Regional Delegation, Ministry of Public Health Afghanistan.

Keywords: Cataract Surgery; Intraocular Lens; Posterior Capsule tear

Abbreviations

AC IOL: Anterior Chamber Intraocular Lens; AMD: Age related Macula Degeneration; AD: Autosomal Dominant; BCVA: Best Corrected Visual Acuity; CCC: Continuous Curvilinear Capsulorrhexis; DM: Diabetes Mellitus; ECCE: Extra-Capsular Cataract Extraction; ICCE: Intra-Capsular Cataract Extraction; IOL: Intraocular Lens; IOP: Intraocular Pressure; MSICS: Manual Small Incision Cataract Surgery; PC IOL: Posterior Chamber Intraocular Lens; PC tear: Posterior Capsule tear; Phaco: Phacoemulsification; RACSS: Rapid Assessment of Cataract Surgical Services; SPSS: Statistical Package for Social Scientists; VA: Visual Acuity; WHO: World Health Organization; ARCS: Age Related Cataract Surgery; NEH: Noor Eye Hospital

Introduction

Blindness (visual acuity of less than 3/60 in the better eye with available correction) is estimated to affect around 39 million people in the world out of which 19.9 million due to cataract. An additional 246 million have low vision (visual acuity of <6/18 to ≥3/60 in better eye with available correction) giving a total of 285 million people with visual impairment (visual acuity <6/18 to ≥6/60 in the better eye with available correction). Ninety percent of worlds visually impaired reside in developing countries with preventable causes accounting for as high as 80% global visual impairment burden. From the 1990 global estimate of visual impairment it was projected that by the year 2020, seventy nine million people will become blind if no intervention is made. The World Health Organization (WHO) came up with an intervention strategy called VISION 2020 "The Right to Sight". This is a global initiative of the World Health Organization and the International Agency for Prevention of Blindness whose main aim is to eliminate the main causes of avoidable blindness by 2020.

Literature Review

Epidemiology of cataract

Cataract as defined by WHO is clouding of the crystalline lens of the eye which prevent clear vision. Cataract is leading cause

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of blindness and visual impairment. Globally as at 2010 it was estimated that cataract was responsible for 51% of world blindness, representing about 19.9 million people with 65% of people visually impaired and 82% of all blind being 50 years and older [1-4]. The other leading causes of blindness included glaucoma (8%), Age related Macular Degeneration (5%), childhood blindness and corneal opacities (4%), uncorrected refractive errors and trachoma (3%), and diabetic retinopathy (1%). The undetermined causes where 21% [4]. Cataract was also found to be principal cause if visual impartment after uncorrected refractive errors amounting to 33% for the former and 43% for the later. The other causes retinopathy, trachoma and corneal opacities, all about 1% each. A large proportion of causes, 18%, remained undetermined [5,6].

In Cameroon a RACSS survey done on people age 40 and above in the Limbe urban area and Muyuka rural area by Oye et al showed prevalence of bilateral blindness to be 1.1% and 1.6% respectively with cataract to be the leading cause of blindness 21% and 62.1% respectively.

In Nigeria a national survey found cataract to be responsible for 45.3% of severe visual impairment and 43% of blindness [7]. Similar results were also noted in RACSS survey at Embu district Kenya which showed cataract to be the commonest course of blindness (39.7%) [8].

Classification of cataract

Cataract can be classified as either congenital (developmental) or acquired. Acquired cataract can be classified as Age-related cataract, Secondary cataract and Cataract associated with systemic diseases. Include Diabetes Mellitus, Myotonic dystrophy, Atopic dermatitis and Neurofibromatosis-2. Secondary (complicated) cataract develops as a result of some other primary ocular disease commonly chronic anterior uveitis, acute congestive angle-closure, high myopia and hereditary fundus dystrophies. Systemic medication e.g. Steroids, and Ionizing radiation and ultra violet rays are also associated with cataracts [9].

Age related cataract: Prevalence of age-related cataract increases with age and prevalence doubles with each decade of age after forty years, so that everyone in their nineties is affected. Age related cataract usually begins after the age of 40 years, although in some parts of Asia it is not uncommon for them to begin earlier, although in some parts of Asia it is not uncommon for them to begin earlier [10]. As the lens ages, it increases in weight and thickness and decreases in accommodative power. As new layers of cortical fibres are formed concentrically, the lens nucleus undergoes compression and hardening (nuclear sclerosis). Chemical modification of the nuclear proteins also increases pigmentation, such that the lens increasingly takes on a yellow or brownish hue with advancing age [11]. Age-related cataract can be classified into subcapsular, nuclear, cortical cataract. Anterior subcapsular cataract lies directly under the anterior lens capsule and is associated with fibrous metaplasia of the lens epithelium. Posterior subcapsular opacity lies just in front of the posterior capsule. Due to its location at the nodal point of the eye, a posterior subcapsular opacity has a more profound effect on vision than a comparable nuclear or cortical cataract. Near vision is frequently impaired more than distance vision [12]. Nuclear cataract is an exaggeration of the normal ageing changes involving the lens nucleus and often associated with myopia due to an increase in the refractive index of the nucleus and with increased spherical aberration. Cortical cataract may involve the anterior, posterior or equatorial cortex. Patients with cortical opacities often complain of glare due to light scattering [13-15].

Risk factors for cataract

There are various risk factors for cataract. These include: smoking, diabetes, ultraviolet-B (UV- B) radiation, and ionizing radiation, medications such as steroids and topical intra- ocular pressure lowering agent and Genetics.

Management of cataract

The mainstay of treatment is surgery and cataract surgery is the removal of the pacified crystalline lens and insertion of a synthetic intraocular (IOL) lens. If an IOL cannot be used, contact lenses or eyeglasses must be worn to compensate for the lack of a natural lens. Cataract surgery aims to rehabilitate blind or visually impaired persons by restoring their eye sight so that their quality of life and ability to function are returned to normal or as near normal as possible [16-20].

Although cataract surgery has been shown to be one of the most cost-effective health interventions, Cataract surgery visual outcome can be used as an indicator to measure performance so as to monitor the quality of cataract services. The outcome can be assessed with full spectacle correction ("best vision") or with available correction ("functioning 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). These broad categories can further be subdivided into: 6/6 excellent, 6/9 very good and 6/12 good.

Indications for cataract surgery: Mainly indicated in the restoration of visual function and improving the quality of vision. Also indicated were cataract is a cause of ocular morbidity like in phacomorphic glaucoma or hinders manoeuvres on the retina as in diabetic retinopathy. It can also be cosmetic such as in case of a mature cataract in an otherwise blind eye to restore a black pupil.

Pre-operative evaluation: More often than not patient will present with poor vision on the affected eye. Visual acuity is tested for both far and near. A cover-uncover test may reveal possibility of amblyopia if strabismus is present. Examination of ocular adnexa may reveal abnormalities and infections that may predispose to endophthalmitis and which may require effective preoperative treatment. Anterior segment findings such as corneal scar, shallow anterior chamber and a poorly dilating pupil can render a cataract surgery difficult. A relative afferent pupillary defect may highlight problems with optic nerve. Pseudoexfoliation may result in complications and the surgery should therefore be done cautiously. Fundus pathology such as age-related macular degeneration may affect the visual outcome [9]. B-scan ultrasonography of the posterior segment of the eye is useful whenever it is impossible to visualize the retina because of a dense cataract. Ultrasonography can elucidate whether a retinal detachment, vitreous opacity, posterior pole tumour, or staphyloma is present [11]. A general medical evaluation aims at identifying comorbidity that may affect surgery.

A history of cardiac, pulmonary events especially if recent is

important. Adverse drug reactions and use of anticoagulants and prolong oral steroids is also important [21-23].

Biometry: Biometry facilitates calculation of the lens power likely to result in the desired postoperative refractive outcome. It involves the measurement of two ocular parameters; keratometry which measures the curvature of the anterior corneal surface expressed in dioptres or mm of radius of curvature and; axial length which is the anteroposterior dimension of the eye in millimetres. This is achieved by use Sanders-Retzlaff-Kraff (SRK II), SRK/T, Holladay 1, Holladay 2 and Hoffer Q formulae and have been demonstrated to have equivalent refractive results.

Types of cataract surgery: Techniques for cataract surgery has changed dramatically over the past decades. Couching involves the use of a sharp or blunt instrument to dislocate the cataract lens and push it back into the posterior chamber of the eye.

Extra capsular cataract extraction (ECCE), manual small incision cataract extraction (MSICS), phacoemulsification (Phaco) are the common type of cataract surgery techniques performed worldwide.

Extra capsular cataract extraction: It involves manual expression of the lens through a large (Usually 10–12 mm) incision made in the cornea or sclera. Although it requires a larger incision and the use of stitches, the conventional method may be indicated for patients with very hard cataracts or other situations in which phacoemulsification are problematic. Manual small incision cataract surgery (MSICS): The lens nucleus is prolapsed through a self- sealing scleral tunnel wound. An appropriately constructed scleral tunnel is watertight and does not require suturing [24].

Intra-capsular cataract extraction: Involves removing the whole lens still within its intact capsule. This technique is hardly used in the developed world as the visual results are generally poorer and the operative and postoperative complications greater due to the large incision required and pressure placed on the vitreous body. It remains common in the developing world, however, because it requires less costly and sophisticated instruments, there is less dependency on back-up services and a reliable electricity supply, and it can be performed after a minimum of training [25]. Phacoemulsification: This is the most common technique used in developed countries. Phacoemulsification with foldable IOLs is undoubtedly the gold standard wherever Phaco machines and trained surgeons are available and the service affordable. Unfortunately, the technique depends upon not only just a costly piece of technology, but also on more expensive consumables and trained human resource.

Both Phacoemulsification and MSICS achieved excellent visual outcomes with low complication rates. MSICS is significantly faster, less expensive, and less technology dependent than phacoemulsification. MSICS is a more appropriate surgical procedure for the treatment of advanced cataracts in the developing world [26,27].

Complications of cataract surgery

Complication following cataract surgery represent a significant obstacle to the success of any blindness prevention programme and to the successful implementation of VISION 2020. At a conservative estimate, at least 25% (or 1.5 million) of the six million cataract operations performed annually in developing countries will have poor outcomes. About one quarter of these poor outcomes are due to surgical complications. Over 375,000 people can therefore suffer permanent visual impairment every year as a result of surgical complications. Studies in, Bangladesh, Kenya, Pakistan showed poor outcome due to surgical complications to be 30%, 22%, 25% respectively .The most important surgical complications that affect the visual outcome are capsular rupture and vitreous loss, which is relatively common and potentially serious post-operative endophthalmitis. These complications may occur in about 6% of cataract surgeries cases in the developing world compared to about 4% in developed Countries [28-31]. Prophylactic intra-operative intracameral antibiotics has reduced this risk of developing endophthalmitis significantly [32]. In high-income countries, the incidence of capsular rupture and vitreous loss appears to be declining and is now in the region of 1–2%. This improvement may be related to the use of phacoemulsification and to earlier intervention, which means that the great majority of cataracts are now removed before they are mature. In low- and middle-income countries, however, the incidence of capsular rupture and vitreous loss appears to be higher [32]. This is probably due to the greater complexity of many cataract operations in developing countries, rather than to specific deficiencies of training, expertise, or equipment used.

The incidence of endophthalmitis may vary. Studies from Europe give the estimated [33]. At Aravind Eye Hospital, in India, this incidence is about 0.05% [34].

The causes of endophthalmitis might vary with geography. In most European studies, *Staphylococcus epidermidis* is the most common infecting microorganism. This bacterium is found in normal eyelid skin and conjunctiva, and it enters the eye during surgery. However, in South India, *Nocardia* species were the commonest cause of infection. When endophthalmitis does occur, the prognosis is grim. In the UK, one third of patients who suffered this complication had a final visual acuity (VA) of less than 6/60, and 13% had lost all light perception. At Aravind Eye Hospital in India, 65% of eyes had VA <6/60. However, these figures also show that the prognosis following endophthalmitis is by no means hopeless.

Studies in Ghana showed early surgical complications occurred in 10.1% of eyes with cornea oedema being common followed by hyphema. Other early complication noted were high IOP, iridodialysis, dislocated IOL, striate keratitis, posterior synaechia, posterior capsule tear, iritis, Vitreous haemorrhage. Posterior capsule opacification was the most common late surgical complication and occurred in 1.4% of eyes this was followed by vitreous loss which occurred in 0.5% of eyes. Other late complications noted were macular oedema.

In western region of Nigeria studies done also demonstrated posterior capsular with vitreous loss (27.35%) and posterior capsular rupture without vitreous loss (6.28%) as commonest intraoperative complication and capsular opacity being the most common post-operative complication. Other complication noted were, retained lens material, bullous keratopathy, intra ocular lens dislocation and, endophthalmitis.

In Kenya posterior capsule (PC) tear without vitreous loss and PC tear with vitreous loss was 0.8 % and 0.5% respectively .Other post-operative complications were corneal oedema with descemet folds,

shallow anterior chamber mild iritis and peaked pupil, PCO, cystoid macular oedema [35].

Justification

According to the World Health Organization (WHO), cataract is the leading cause of blindness and visual impairment throughout the world. Despite an increase in the number of people who undergo cataract surgery the visual outcome has remained poor necessitating the need for a continuous audit [36].

Cataract audit is an essential tool in monitoring quality of cataract surgical services. This study aims at looking at the outcome of age-related cataract surgery done in this hospital. In addition, no similar study has been done previously in Noor Eye Hospital and the region at large. Information obtained in this study will be used to institute the basis for a prospective monitoring of outcome of cataract surgery in the hospital and the region at large.

Objectives

Broad objectives

To assess the outcome of age related cataract surgery in Noor Eye Hospital Kabul.

Specific objectives

- To determine the visual outcome of age related cataract surgery at Noor Eye Hospital Kabul.
- To determine factors influencing outcome in age related cataract surgery at Noor Eye Hospital.

Materials and Methods

Study area

The study was carried out in Noor Eye Hospital Kabul. The hospital is located in the Heart of Kabul city.

The hospital is a regional referral hospital with an eye unit and has 15 resident ophthalmologists and occasionally visiting ophthalmologists and at times residents on training.

Study design and study period

This was a retrospective hospital based case series. The study period was from 15th Feb 2018 to 15th Jun 2018.

Study population

All patients were over 40 years who underwent cataract surgery at Noor Eye Hospital from 15th Feb 2018 to 15th Jun 2018.

Sampling

Sample population: Patients with 40 years of age and above seen at Noor Eye Hospital.

Sampling procedure: A consecutive sampling method was used to select the patient files. The patient files were allocated serial numbers from 001 to 400. The files were selected consecutively beginning with the first file till the total number of files were exhausted. In the course of sampling files that did not meet the inclusions criteria were discarded and next file taken [37].

Eligibility criteria

Inclusion criteria: Eyes of patients aged 40 years and above who had age related cataract surgery at the center.

Exclusion criteria: Any eye with missing or incomplete records (visual acuity). Eyes of patients with pre-existing ocular disease or other causes of cataract.

Data collection

Information was extracted from patient files into the questionnaires. The collected information included: Demographics, preoperative examination information (visual acuity, intra ocular pressure, biometry and any pathology that may affect the outcome), surgical information (Date, surgical techniques, intraocular lens position, method of capsulotomy, use of sutures, intraoperative complications), and Post-operative examination of visual acuity day 1.7 and 28.

Data management and analysis

The data collected was entered at the end of each day. Data entry was done daily. Data entry and analysis was done by using Acastat and with daily backups on external hard disc. All descriptive data was summarized in charts, tables and graphs. Categorical and continuous variables describing demographics, Preoperative examination, surgery and post- operative examination was summarized into proportions, means and medians as relevant. Differences in means was analyzed further using the *t*-test for continuous variables and Chi- square for discrete variables, to test associations between the variables. All statistical tests was done at a 0.05 level of significance [38].

Data presentation

Data was presented in tables, graphs, charts. Descriptive information showed mean, frequency and proportion of various variables Tables with Bivariate and multivariate analysis showed the comparison between variables outlining the specific p-value attained.

Ethical considerations

Ethical approval: Approval was sought from the Noor Eye Hospital/University of Kabul Ethics & Research Committee, the Management and Ethics Committee of the Noor Eye Hospital and the Regional Delegation, Ministry of Public Health Afghanistan.

Confidentiality: All data was handled with strict confidentiality in this study. Nothing to identify the patient or clinician was produced in analyzed works for this study. Data was kept under lock and key and also in a password protected computer to prevent illicit access. The raw data was destroyed by shredding all hard copies questionnaire and by formatting or secure deleting all soft copies that were saved on flash discs, hard drives and computer hard drives.

Study limitations

Patient with resolved or subclinical ocular disease or ocular disease which may have passed unnoticed, was not captured preoperatively and may affect the outcome surgery.

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References

1. Pascolini D, Mariotti SP. World Health Organization, Global data on Visual impairment 2010. Br J Ophthalmol. 2012; 96: 614-618.
2. World Health Organization. "Global initiative for the elimination of avoidable blindness". 2000.
3. Blindness and vision impairment prevention.
4. World Health Organization. "Global Data on Visual Impairments". WHO Press. 2010.
5. Joseph Enyegue Oye, Hannah Kuper. Prevalence and causes of blindness and visual impairment in Limbe urban area, South West Province, Cameroon. Br J Ophthalmol. 2007; 91: 1435-1439.
6. JE Oye, H kuper, B Dineen, R Befidi–Mengue and A Foster. Prevalence and causes of blindness and visual impairment in Muyuka: a rural health district in South West Province, Cameroon. Br J Ophthalmol. 2006; 90: 538-542.
7. Nigerian blindness and Visual impairment survey. 2005-2007.
8. Karimurio JJ, Marco S, Gichangi M, et al. Rapid assessment of cataract surgical services in Embu district, Kenya. East Afr. J. Ophthalmol. 2013; 5: 13.
9. Jack JK, Brad B, Kanski. Clinical Ophthalmology, a Systematic Approach. Elsevier publishers, 7th edition. 2011.
10. William GH, John PW, William S. Risk Factors for Age-related cataracts. Epidemiologic Reviews. 1995; 17: 336-346.
11. American Academy of Ophthalmology, Section 11 Lens and Cataract. 2012.
12. Gordon J, Darwin CM, Robert AW, Sheila KW. The Epidemiology of Eye Disease, Imperial College Press, 3rd Edition. 2012.
13. Lindfield R, Polack S, Wadud Z, Choudhury KA, Rashid AK, Kuper H. Causes of poor outcome after cataract surgery in Satkhira district, Bangladesh. Eye. 2008; 22: 1054–1056.
14. WHO, author. Informal consultation on analysis of blindness prevention outcome. Geneva: World Health Organization. WHO/PBL/98/68
15. Narváez J, Zimmerman G, Stulting RD, Chang DH. Accuracy of intraocular lens power prediction using the Hoffer Q, Holladay 1, Holladay 2, and SRK/T formulas. J Cataract Refract Surg. 2006; 32: 2050-2053.
16. Gilbert CE, Murthy GVS, Sivasubramaniam S, Kyari F, Imam A, Rabiu MM, et al. "Couching in Nigeria: Prevalence, Risk Factors and Visual Acuity Outcomes." Ophthalmic Epidemiology. 2010; 17: 269-275.
17. Ntim-Amponsah CT. "Traditional Methods of Treatment of Cataract seen at Korle-Bu Teaching Hospital." West African Journal of Medicine. 1995; 14: 82-87.
18. Schémann JF, Bakayoko S, Coulibaly S. "Traditional couching is not an Effective Alternative Procedure for Cataract Surgery in Mali." Ophthalmic Epidemiology. 2000; 7: 271-283.
19. Das B. "Couching: A Quackery in Cataract Surgery." Journal of the Indian Medical Association. 1969; 52: 175-178.
20. Liu SR, Su XL. "Analysis of 10.686 cataract operations in Guangdong Province." Chuang Hua Yen Ko Tsa Chih. 1992; 28: 267-269.
21. Merabet LB, Wanye S. "Letter to the Editor, Eye Care in the Developing World: How soon is now?" Optometry and Vision Science. 2008; 85: E608-E610.
22. Basti S, Vasavada AR, Thomas R, Padmanabhan P. Extracapsular cataract extraction: Surgical techniques. Indian J Ophthalmol. 1993; 41: 195–210.
23. Parikshit Gogate. Comparison of various techniques for cataract surgery, their efficacy, safety, and cost. Oman J Ophthalmol. 2010; 3: 105–106.
24. Sanduk R, Geoffrey T, David C, Leena B, Daniel CK, William R, et al. "A Prospective Randomized Clinical Trial of Phacoemulsification vs Manual Sutureless Small-Incision Extracapsular Cataract Surgery in Nepal I". American Journal of Ophthalmology. 2007; 143: 32–38.
25. David A, Abhay. Cataract and surgery for cataract. BMJ. 2006; 333: 128–132.
26. Ruit S, Tabin G, Chang D, Bajracharya L, Kline DC, Richheimer W, et al. A prospective randomized clinical trial of phacoemulsification vs manual sutureless small-incision extracapsular cataract surgery in Nepal. Am J Ophthalmol. 2007; 143: 32-38.
27. Henning 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.
28. Yorston D. Cataract Complications. Community Eye Health. 2008; 21: 1-3.
29. Bourne RR, Dineen BP, Ali SM, Huq DM, Johnson GJ. Outcomes of cataract surgery in Bangladesh: results from a population based nationwide survey. Br J Ophthalmol. 2003; 87: 813–819.
30. Mathenge W, Kuper H, Limburg H, Polack S, Onyango O, Nyaga G, et al. Rapid assessment of avoidable blindness in Nakuru district, Kenya. Ophthalmology. 2007; 114: 599–605.
31. Bourne RRA, Dineen B, Jadoon MZ, Lee PA, Khan A, Johnson GJ, et al. Outcomes of cataract surgery in Pakistan: results from the Pakistan National Blindness and Visual Impairment Survey. Br J Ophthalmol. 2007; 9: 420–426.
32. Kothari M, Thomas R, Parikh R, Braganza A, Kuriakose T, Muliyil J. The incidence of vitreous loss and visual outcome in patients undergoing cataract surgery in a teaching hospital. Indian J Ophthalmol. 2003; 51: 45–52.
33. Kamalarajah S, Silvestri G, Sharma N, Khan A, Foot B, Ling R, et al. Surveillance of endophthalmitis following cataract surgery in the UK. Eye. 2004; 18: 580–587.
34. Lalitha P, Rajagopalan J, Prakash K, Ramasamy K, Prajna NV, Srinivasan M. Post cataract endophthalmitis in South India: incidence and outcome. Ophthalmology. 2005; 112: 1884–1889.
35. Litchi, BS Boadi-Kus, OV Ndudiri, EA Ofori. Evaluation of Post-Operative Visual Outcomes of Cataract Surgery in Ghana. International Journal of Health Research. 2012; 5: 35-42.
36. MA Isawumi, EO Soetan, AO Adeoye, and CO Adeoti. Evaluation of Cataract Surgery Outcome in Western Nigeria. Ghana Med J. 2009; 43: 169–174.
37. Trivedy J. Outcomes of high volume cataract surgery at Lions Sights First Eye Hospital in Kenya. Nepal J Ophthalmol. 2011; 3: 31-38.
38. Wanga SK, Lemeshow S. Sample size determination in health studies. A practical manual. Ginebra: World Health Organization. 1991.