

**VISUAL OUTCOME AND CAUSES OF POOR VISUAL OUTCOME OF
MANUAL SMALL INCISION CATARACT SURGERY IN ADULT
PATIENTS AT MUHIMBILI NATIONAL HOSPITAL FROM MAY 2017
TO JANUARY 2018**

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**Mmed (Ophthalmology) Dissertation
Muhimbili University of Health and Allied Science
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MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES



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TO JANUARY 2018**

By

Condrada Herman Ngonyani

**A Dissertation Submitted in Partial Fulfillment of the Requirements for Degree
of Master of Medicine (Ophthalmology) of
Muhimbili University of Health and Allied Sciences**

Muhimbili University of Health and Allied Sciences

May, 2018

CERTIFICATION

The undersigned certify that she has read and hereby recommend for acceptance by Muhimbili University of Health and Allied Science a dissertation entitled: *‘Visual Outcome and causes of poor visual outcome of Manual Small Incision Cataract Surgery among adult patients at Muhimbili National Hospital from May 2017 to January 2018*, in (partial) fulfillment of the requirement for the degree of Master of Medicine (Ophthalmology) of Muhimbili University of Health and Allied Science.

Dr. Milka Mafwiri

(Supervisor)

Date _____

DECLARATION AND COPYRIGHT

I, **Dr. Condrada Herman Ngonyani**, declare that this dissertation is my own original work and that it has not been presented and will not be presented to any other university for a similar or any other degree award.

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Date.....

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DEDICATION

To my children Lorenzo and Loreen Mallaba

ABSTRACT

Background

Cataract is the opacification of the crystalline lens of the eye, which causes progressive decrease in visual acuity, eventually leading to blindness. The precise treatment of cataract is surgical extraction of the opacified lens. Cataract extraction is the most common procedure performed worldwide; despite large number of cataract surgeries being performed, poor surgical outcome results in poor vision there by contributing to failure to reduce cataract blindness. In order to achieve better visual outcomes, monitoring systems of cataract surgery is important to be established.

Aim

To assess the post-operative visual outcome and causes of poor visual outcome in adult patients operated for manual small incision cataract surgery at Muhimbili National Hospital (MNH).

Methodology

This was a hospital based observational descriptive longitudinal study of consecutive patients underwent cataract surgery at Muhimbili National Hospital from May 2017 to January 2018. A total of 190 patients who met the inclusion criteria were recruited to the study. The patients were examined 1st day post-operative, 7th day post-operative and 6th weeks post operatively.

Results

The mean age and standard deviation of the study population was 64.2(11.9) years and the mean age of male and female patients were 63.6(10.8) and 65.0(13.3) years respectively. The best corrected visual acuity at 6th week post-operative was 6/6-6/18(good outcome) in 110(65.1%), <6/18-6/60 (borderline) 30(17.8%) and <6/60 (poor outcome) in 29(17.2%). The leading intra-operative complication was posterior capsule tear in 23(52.3%) eyes. The common early post-operative complications were elevated IOP and corneal edema, and the common late complication was posterior capsule opacification. The residual refractive error was astigmatism in 57(35.6%) eyes, myopia 48(30%), and hyperopia 22 (13%) eyes. Intra-

operative complications (31%), post-op complications (27.8%), residual refraction (10.4%) and comorbidities (31%) were the cause of poor visual outcome.

Conclusion

The cataract surgical outcome at Muhimbili National Hospital was below WHO standards. The commonest intra-operative complications were iris prolapse and posterior capsule tear. Early complications were corneal edema and high intraocular pressure. The commonest late complication was posterior capsule opacification. Astigmatism was the commonest residual refractive error. The factors associated with poor outcome were mainly presence of intraoperative, post-operative complications and ocular comorbidities.

Recommendations

Measures to improve post-operative visual outcome include good pre-operative evaluation and proper selection of patients for surgery to minimize poor outcome. There is a need for cataract surgery monitoring tool to be initiated to the hospital so as to assess the outcome and quality of the surgeries that are conducted in the hospital.

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LIST OF ABBREVIATIONS

BCVA	Best Corrected Visual Acuity
CME	Cystoids Macular Edema
D	Dioptre
ECCE	Extra Capsular Cataract Extraction
ICCE	Intra Capsular Cataract Extraction
IOP	Intra Ocular Pressure
IOL	Intra Ocular Lens
MNH	Muhimbili National Hospital
MUHAS	Muhimbili University of Health and Allied sciences
PCO	Posterior Capsule Opacification
MSICS	Manual Small Incision Cataract Surgery
SL	Slit lamp
SPSS	Statistical Package for Social Scientist
VA	Visual Acuity
WHO	World Health Organization

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DEFINITION OF TERMS

Best corrected visual acuity: The best achievable visual acuity after correction of any refractive errors with spectacles, contact lenses or other corrective measures.

Cataract: Is the opacification of the crystalline lens of the eye which causes progressive decrease in visual acuity.

Visual acuity: Sharpness of vision, which is measured by the ability to discern letters or numbers at a given distance according to a fixed standard.

Refraction: An objective and subjective eye examination procedure that measures a person's prescription for eyeglasses or contact lenses.

CHAPTER ONE

1.0 INTRODUCTION

1.1 BACKGROUND

A cataract is the opacification of the crystalline lens of the eye, which causes progressive decrease in visual acuity, eventually leading to blindness (1). A cataract can occur in either or both eyes and cannot spread from one eye to another. It is the leading cause of avoidable blindness worldwide, accounting for three quarters of the blindness in the developing world. About 20 million people globally are blind due to cataracts (2,3). Unoperated cataract accounted for 52% of blindness in one region of Tanzania (4).

Cataract can be caused by a number of factors, but most common is advancing age. Apart from getting older, the other common causes include trauma, primary ocular diseases like uveitis and glaucoma; systemic diseases including metabolic disorders like diabetic mellitus, galactosemia, homocysteinuria, fabry's, renal diseases, down's syndrome. Cataract can also be caused by environmental exposure like ionizing radiation and the prolonged use of medications eg. Steroids (5,6). Other risk factors including; tobacco smoking, exposure to sun light, poor diet which lacks anti-oxidant vitamins, pseudo exfoliation, dehydration crisis, and menopause (7).

The main treatment of cataract is to remove the opacified lens and correct the eventual optical condition. The aim is to prevent blindness by restoring normal vision as well as improving quality of life (8). Prior to surgery the patient has to be evaluated to have an idea of the post-operative visual prognosis, and decision on type of surgery(8). There are different types (procedures) of cataract surgery, intra capsular cataract extraction (ICCE), in which the whole lens is removed within its capsular bag. The procedure has been phased out in many parts of the world (1,8). Another type is Extracapsular Cataract Extraction (ECCE) in which the anterior capsule is opened anteriorly, the nucleus is extracted and the remaining cortical matter is washed out, leaving the posterior capsule intact (1,8). Another type is Small Incision Cataract Surgery (SICS), which is a variant of ECCE where the corneo-scleral tunnel is smaller about 6-7mm(1,8). Phacoemulsification is another variant of ECCE where the lens is

emulsified and aspirated by an ultrasound probe after making a circular opening in the anterior capsule. The incision is small enough to permit the entry of the probe(1,8).

After cataract surgery, aphakia is corrected by implanting intraocular lens and the patient is expected to attend for follow-up. According to WHO standards, the vision is expected to improve to reach good outcome (6/6-6/18), borderline (<6/18-6/60) or poor outcome (<6/60) after removing the cataract. Consequently WHO recommends the following percentages of good outcome >80%, borderline <15% and poor outcome <5% (9,10). Factors that can affect good visual outcome include surgeon experience, sociodemographic characteristics, intraoperative and post-operative complications, residual refraction and comorbidity (11–14). Therefore post-operative care is necessary for monitoring wound healing and management of post-operative complications and residual refractive error.

To ensure quality surgery, monitoring of the post-operative visual outcome is necessary. Monitoring of visual outcome after cataract surgery needs to be done by institutions and individuals surgeons to ensure quality of surgery. Outcome monitoring system will facilitate the eye surgeon and institution to monitor their own result over time and to achieve the proportions of good, borderline and poor outcomes. It will also indicate the cause of poor outcome, enabling the institution/ individual surgeon to address them in order to improve the results of cataract surgery (15,16).Several ways can be employed to monitor cataract surgical outcome including computerized system whereby computers are programmed using standard cataract surgery record which can be added to the routine case notes used in the clinic. Another way is by cataract surgery record where by a special form is designed and filled in each cataract surgery (10,15).

1.2 LITERATURE REVIEW

Epidemiology

Prevalence/incidence

Cataract is the leading cause of blindness worldwide accounting for nearly half of 37 million blind people. Senile cataract is the leading cause of blindness; usually begins to appear after 50 years of age and about half of the people aged 75 are affected. Globally the incidence of new cases of cataract is placed between 4 and 6 million annually (3).

Visual outcome after cataract surgery

Outcome of cataract surgery is an important factor to be looked at, since it is essential tool for monitoring of quality of cataract surgery. There are several studies which have been done to evaluate the outcome of cataract surgery including a study in India by Sudhir in 2016, whereby good visual outcome seen in 86.43% patients, boarder line 11.65% and poor 1.92% (17). In a study by Weiyong Huang in China 2011, visual outcome was good in 62.2% , borderline in 22.2%, and poor in 15% (18).

Another study in Pakistan by Farzeen et al in 2013 results showed 93.3% of operated eyes achieved good postoperative VA (VA>6/18), the proportion of cases of borderline VA was 4.4% and poor outcome was 2.2% (19). A study by Sonron in Trinidad and Tobago in 2015, post-operative cataract VA resulted in 67% having good VA, 21% borderline VA and 12% poor VA (20).

Olawoye et al in a study carried out in Nigeria 2011 showed best corrected vision eight weeks postoperatively to be 78.8% good vision while 17.4% had borderline, and 3.8% had severe visual impairment (21). In Ghana a study by Ilechie et al in 2012 showed the proportion of post-operative eyes with good outcome was 41.2% at 4-6 weeks follow up, outcome was poor in 9.5% at 4-6 weeks follow up (22). Kenyan study by Trivedy J et al at a Lions Sight First Eye Hospital in 2011 showed Uncorrected Visual Acuity 4th week post operation was good in 81.8%, borderline 15.7% and poor 2.4% (23).

Complications of cataract surgery

Complications of cataract can occur either intra operatively or post operatively. A study done in India by Sudhir in 2016 reported that, intra-operative complications were the major cause affecting visual outcome in 8.25%. Posterior capsule rupture occurred in 3.64% and was the most common intra-operative complication followed by posterior capsule rupture with vitreous loss in 3.32% (17).

Indian study by Rajiv in 2010 showed zonular dialysis and vitreous disturbance (0.3%), tear in the posterior capsule (1.3%), residual cortex in the anterior chamber (10.2%) and endophthalmitis to be the most common complications (24). Trivedy's study in Kenya showed posterior capsule tear without vitreous loss 0.3%, posterior capsule tear with vitreous loss 0.5% and hyphema 0.8% (23). A study by Isawumi in Nigeria found vitreous loss 27.35%, posterior capsule tear 6.26% and posterior capsule opacity 6.2% (25).

Causes of poor visual outcomes after cataract surgery

Poor visual outcome after cataract surgery can be caused by number of causes including the presence of comorbidities. The outcome in eyes with significant other pathology is likely to be poor. Diseases such as chronic glaucoma, optic atrophy, age-related macular degeneration and diabetic retinopathy damage the retina and/ optic nerve thereby irreversibly reducing the visual acuity of the affected eye. When such diseases co-exist with age related cataract they will result in poor visual outcome following cataract surgery (14,26). A study by Pessoa et al in Brazil has found comorbidities (56%) to be a cause of poor visual outcome (27). While Lindfield et al found 33.8% (12) and Kumar in India had preexisting glaucoma (10%), diabetic retinopathy (9.1%) and age related macular degeneration (21.6%) as a cause of poor outcome (27).

Surgical complications is another cause whereby poor surgical technique with intraoperative complications is likely to result in a poor outcome (14,26). Lindfield found 30.6%, Pessoa 28.8% and a study by Isawumi et al showed vitreous loss (27.35%) and 6.28% posterior capsule rupture (12,25,27).

Residual refractive error also can cause poor outcome whereby significant astigmatism or uncorrected ametropia following cataract surgery results in a poor outcome (26). This can be reduced by performing biometry prior to surgery and implant the right power IOL. Appropriate removal of suture and spectacle correction 8 weeks after surgery also reduces astigmatism(14). A study by Bourne et al found 53.4% had refractive error as a cause of poor outcome, Malik et al had 75.5% and Pessoa et al had 15.2% (13,27,29).

Post-operative complication (sequela) is another cause of poor visual outcome. These complications may be early or late. Persistent inflammation in the early post-operative period and posterior capsule opacification in the late post-operative period may result in a poor outcome (14,26). In Bangladesh the study by Lindfield showed posterior capsule opacification were 9.7% and Kumar in India found posterior capsule opacification (18.2%) be the cause of poor outcome (12,28).

Socio demographic characteristics

Studies have found that education level and socio-economic status of the patients can affect visual outcome. Patients who are less educated may not follow physicians recommendations related to post-surgical treatment and care, consequently causing some post-surgical complications. Similarly, low socio economic status may hinder post-operative follow up due to inadequate funds for transport to hospital and purchase of post-operative medications. Bourne et al found that, illiteracy was significantly associated with visual outcome (13). Another study by Quintana et al in Spain showed that the higher the education level and the employment status the greater the improvement in visual acuity (11).

1.3 PROBLEM STATEMENT

Un-operated cataract remains the leading cause of blindness worldwide, although the disorder can be effectively treated with a standard surgical procedure. Cataract surgery has been one of the most commonly performed surgical procedures worldwide. Poor surgical outcomes and inadequate access to surgery are major obstacles to the reduction of blindness from cataract. But success depends on monitoring surgical quality and visual acuity after cataract surgery (30).

Monitoring of visual outcome after cataract surgery is an important practice. It needs to be done by the institutions and individuals surgeons to ensure quality of surgery (31). A simple system to monitor cataract surgical outcome can sensitize surgeons for quality control which can lead to a decrease in complication rates and improved visual outcomes (32). However the MNH as an institution has no established system or a standard tool to monitor cataract surgical outcome. Collin C recommends that, to improve the outcome of cataract surgery, the individual cataract surgeon must monitor their intra-operative complications and the visual outcome of their surgery (14).

1.4 RATIONALE

Study results would show the outcome of cataract surgery at MNH. This can enable the department to know the quality of MSICS, the surgical complications and causes of poor visual outcome. The department can address the challenges and hopefully the study monitoring tool will be used to monitor visual outcomes at MNH as well as to improve the quality of cataract surgeries. The study is also used as a partial fulfillment for the award of Degree of Masters of Medicine in Ophthalmology.

1.5 CONCEPTUAL FRAMEWORK

Visual outcome after cataract surgery can be good or poor depending on several factors. Among the factors which can cause poor outcome including intra operative complications which are posterior capsule tear, vitreous loss, and post-operative complications including infection (endophthalmitis), corneal edema, posterior capsule opacification, retinal detachment and macular edema. Another factor is when the eye has other pathologies like glaucoma, optic atrophy, age related macular degeneration and diabetic retinopathy.

Residual refractive error also can affect surgical outcome; when inaccuracy of biometry reading can lead to implantation of incorrect power of IOL. Surgeon experience can also affect the visual outcome. The more the surgical experience the better the outcome.

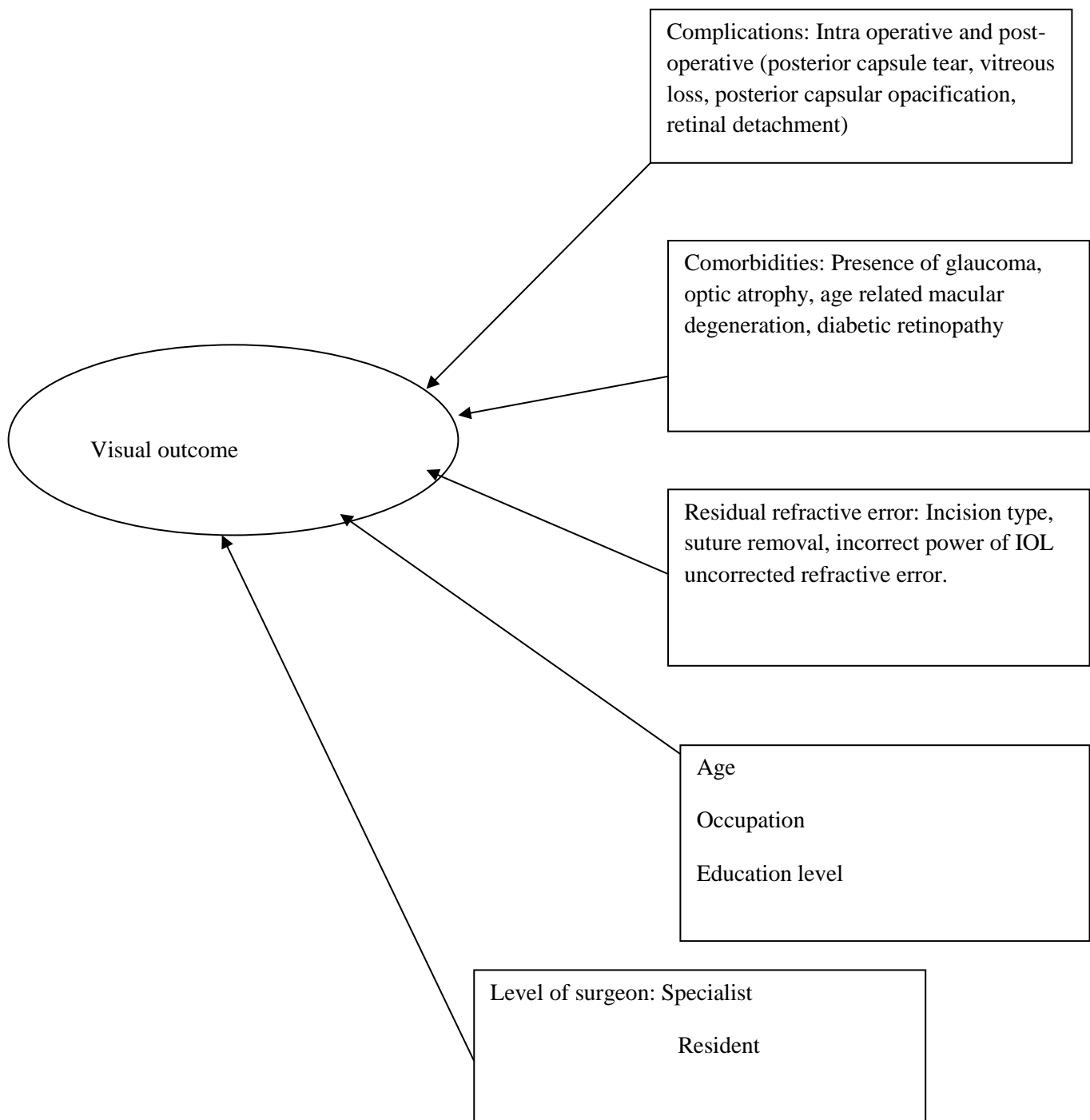


Figure 1: conceptual framework

1.6 RESEARCH QUESTIONS

1. What are the socio demographic characteristics of the patients who underwent MSICS at Muhimbili National Hospital?
2. What was the pattern of post-operative best corrected visual acuity in patient who underwent MSICS at Muhimbili National Hospital?
3. What were the intra operative and post-operative complications in patients who underwent MSICS at Muhimbili National Hospital?
4. What were the post-operative residual refractive errors in patients who underwent MSICS at Muhimbili National Hospital?
5. What were the causes of poor surgical outcome in patients who underwent MSICS at Muhimbili National Hospital?

1.7 OBJECTIVES

1.7.1 Broad objective

To assess the visual outcome and causes of poor visual outcome in adult patients who underwent manual small incision cataract surgery at Muhimbili National Hospital.

1.7.2 Specific objectives

1. To assess the best corrected visual acuity 6 weeks post- operative in adult patients who underwent MSICS at Muhimbili National Hospital.
2. To determine the intra-operative and post- operative complications in adult patients who underwent MSICS at Muhimbili National Hospital.
3. To determine the post- operative residual refractive errors in adult patients who underwent MSICS at Muhimbili National Hospital?
4. To determine the causes of poor visual outcomes at 6 weeks post operation in adult patients who underwent MSICS at Muhimbili National Hospital.

CHAPTER TWO

2.0 METHODOLOGY

2.1 Study design

This was a hospital based observational descriptive longitudinal study.

2.2 Study area

This study was conducted at Muhimbili National Hospital (MNH), which is the tertiary referral center for patients with eye and other diseases from the region of Dares salaam and all other regions across the country, it is located in Ilala Municipal. It is also a teaching hospital for the Muhimbili University of Health and Allied Sciences (MUHAS).

Data was collected from the adult eye clinic in the department of ophthalmology at MNH. Cataract surgeries were performed 4 days per week with average of 2-3 surgeries per operative day. About 2 -3 surgeons performed the surgeries, including residents and specialist.

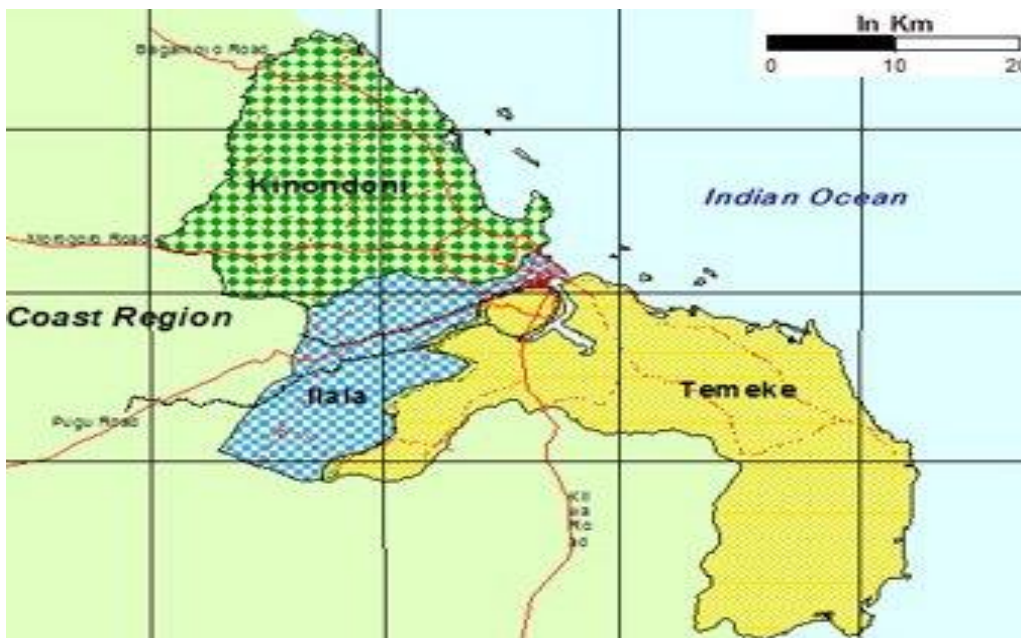


Figure 2: Map of Dar es Salaam region showing municipalities

2.3 Study population

All adult patients who underwent manual small incision cataract surgery at Muhimbili National Hospital during the period of May 2017 to January 2018.

2.4 Inclusion criteria

All patients aged 18 years and above who underwent manual small incision cataract surgery at MNH and who were ready to return for follow-up, up to 6 weeks after surgery.

2.5 Exclusion criteria

1. Patients whose assessment of visual acuity was not possible, eg. Mentally disabled patients.
2. Patients who were not able to complete 6 Weeks follow up.
3. Patients who underwent other cataract surgical procedures like Phacoemulsification and ICCE.
4. Patients with traumatic cataract and complicated cataract.

2.6 Sampling technique

Non probability consecutive sampling technique was used where all patients who underwent MSICS during the study period and who met the inclusion criteria were requested to participate.

2.7 Sample size estimation

Sample size calculation was done using the following formula

$$n' = \frac{NZ^2P(1-P)}{d^2 (N-1) + Z^2P (1-P)}$$

Where

n' = Minimum required sample size

N = Size of the target population = 384 (estimated number of cataract surgery done in Muhimbili National hospital in year 2016 from hospital registry)

Z² = Statistic for 95% level of confidence equal to 1.96

P = Estimated outcome of age related cataract 78.8% (university college hospital, Ibadan Nigeria)

d² = Margin of error = 5%

$$\frac{384 \times 1.96^2 \times 0.788 \times (1-0.788)}{0.05^2 \times (384-1) + 1.96^2 \times 0.788 (1-0.788)}$$

$$= 153$$

Therefore, the minimum sample required was 153; however, all patients who met the inclusion criteria were recruited into the study.

2.8 Data collection

2.8.1 Data collection tools

- a) A semi structured questionnaire composed of demographic characteristics and ophthalmic examination sections was filled by the principal investigator.
- b) Visual acuity assessment: Snellen's chart for literates, tumbling E and Landolt C for illiterate.
- c) Slit lamp Biomicroscope for anterior segment examination.
- d) Slit lamp Bio microscope with 90D lens for posterior segment examination.
- e) Puff Applanation Tonometer for measurements of the Intra-Ocular Pressure (IOP) was used.

- f) Streak Retinoscope and a fully equipped trial case for refraction.

2.8.2 Data collection procedures

The investigator attended the adult eye clinic on every clinic day. All patients operated for cataract using MSICS the day before was informed about the study and requested to participate. A written informed consent was filled and signed by those who met the inclusion criteria and agreed to participate. Baseline information was taken in the recruited patients including names, gender and residency, age and education level. Pre-operative clinical examination was checked through computer system to document the findings of VA, IOP, anterior segment examination and posterior segment examination. The pre-operative visual acuity was classified according to WHO definition of visual acuity (33) appendix IV. Thereafter, Clinical examination commenced with assessment of visual acuity using snellen literate and illiterate E charts with and without pinhole. Best corrected visual acuity was assessed 6 weeks post operation after refraction.

The intra ocular pressure was measured using air puff tonometer machine. Slit lamp examination was performed to assess early post-operative status. Early complications like wound gapping, corneal edema, shallow anterior chamber, hyphema, iris prolapse, pupil irregularity, posterior capsule tear, lens matter in the anterior chamber/vitreous and malposition of the intraocular lens were noted. Operation notes from the computer system were reviewed to obtain intra-operative complications. Noted complications were managed accordingly. Afterwards, patients were instructed to report to the clinic after 7 days.

The patients were examined again on the 7th day started from visual acuity with and without pinhole, intra ocular pressure, slit lamp examination and funduscopy by using 90D lens to monitor the progress and to note the complications like endophthalmitis and post-operative uveitis.

At 6 weeks, examinations included VA, IOP, slit lamp and funduscopy. The late complications like bullous keratopathy, corneal decompression, intra ocular lens (IOL) dislocation and presence of vitreous in anterior chamber, posterior capsule opacification,

cystoid macular edema and retinal detachment were documented. The patients were refracted to obtain the post-operative residual refractive error. At all stages, the visual outcome was classified according to WHO criteria as: good (6/6- 6/18), borderline (6/24- 6/60) and (<6/60) poor (appendix IV). Collected information was filled in a semi structured questionnaire.

2.9 Data management and analysis

Data entry in the computer was done by Epi info programme and data analysis was done using statistical package for social science computer software (SPSS) version 20. Mean, standard deviation, frequency and proportion was used to summarize variables. Chi-square was used for bivariate analysis to assess factors associated with poor surgical outcome and P-value of <0.05 was considered statistically significant.

2.10 Ethical consideration

Ethical approval was sought from Senate Research and Publication Committee of MUHAS. Permission to conduct the study was requested from the Executive Director of MNH through the head of Department of Ophthalmology. Written Informed consent was obtained from all patients. The right to withdraw from the study was explained to the patient. Registration numbers instead of names was used for confidentiality.

CHAPTER THREE

3.0 RESULTS

3.1 Socio -demographic characteristics of the study population

A total of 190 patients met the inclusion criteria and were recruited for the study, however at 6weeks post operatively only 169 eyes were assessed, while 21 patients (eyes) were lost to follow up. Analysis was done on 169 patients (eyes) who completed 6 weeks follow up. The overall mean age and standard deviation of the study population was 64.2(11.9) years and the mean age of male and female patients were 63.6(10.8) and 65.0(13.3) years respectively. About 80% of the study populations were from Dar es Salaam region and nearly one third of them were self-employed. Half of the patients had primary level of education. (Table 1)

Table 1: Socio-demographic characteristics of the study population (n=169)

Characteristic	Number	%
Sex	Male	100
	Female	69
Age group	<45	12
	45-50	8
	>50	149
Residence	Dar es salaam	135
	Other regions	34
Occupational	Peasant	45
	Employed	30
	Self-employed/business	54
	Un employed	17
	Retired	23
Education	No formal education	24
	Primary	79
	Secondary	51
	College/university	15

Table 2: Pre-operative clinical status of the eyes (n=169 eyes)

Parameter		Number	%
VA	<3/60	49	29.0
	<1/60	111	65.7
Type of cataract	LP	9	5.3
	Nuclear sclerosis	90	53.3
	Cortical	2	1.2
	PSC	33	19.5
	Hyper mature	19	11.2
	Nuclear &cortical	24	14.2
	Anterior capsular sclerosis	1	0.6
Vitreous	**Not viewed	169	100
Fundus	**Not viewed	169	100

****Not viewed due to hazy media (lens opacity)**

All eyes had normal IOP, eyelids, conjunctiva, cornea, anterior chamber, Iris and pupil. Most of the patients 111(65.7%) had pre-operative visual acuity of <1/60. The eyes had different morphological types of lens opacification with predominance of nuclear cataract in 53.3%. All eyes had hazy media due to lens opacity therefore fundal detail was not possible. (Table 2)

Table 3: Operative details (n=169 eyes)

		Number	%
Surgeon	Specialist	48	28.4
	Resident	121	71.6
IOL position	In the bag/sulcus	158	93.5
	AC	2	1.2
	None*	9	5.3
Suture	Yes	77	45.6
	No	92	54.4
Incision	Superior	165	97.6
	Temporal	4	2.4
	Scleral incision	169	100

*Left aphakic

Most 71.6% operations were done by the residents, and the intra ocular lens was placed in the bag or sulcus in 158(93.5%). Seventy seven (45.6%) wounds were sutured and all eyes had scleral tunnel incision. (Table 3)

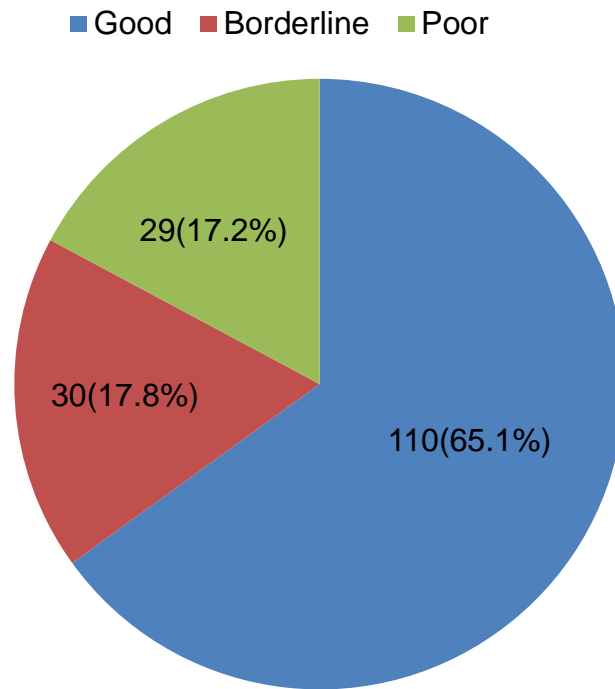


Figure 3: Best corrected visual outcome at 6 weeks post - operative (n=169 eyes)

Majority 65.1% of the eyes had best corrected visual acuity between 6/6-6/18 (good visual outcome) at 6 weeks after cataract surgery.

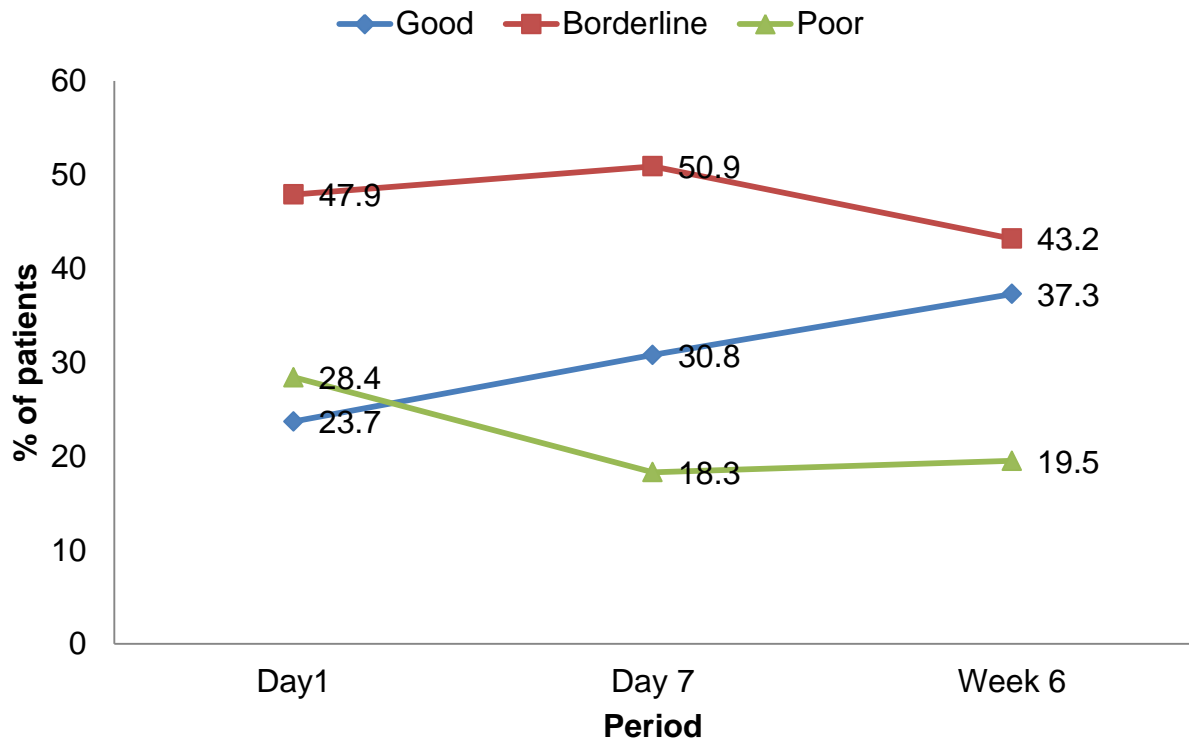


Figure 4: Presenting Visual acuity on 1st, 7th and 6th week period (n=169 eyes)

Majority of the eyes had visual acuity between <math><6/18-6/60</math> (borderline visual outcome) on the 1st, 7th day and 6th week post-operatively.

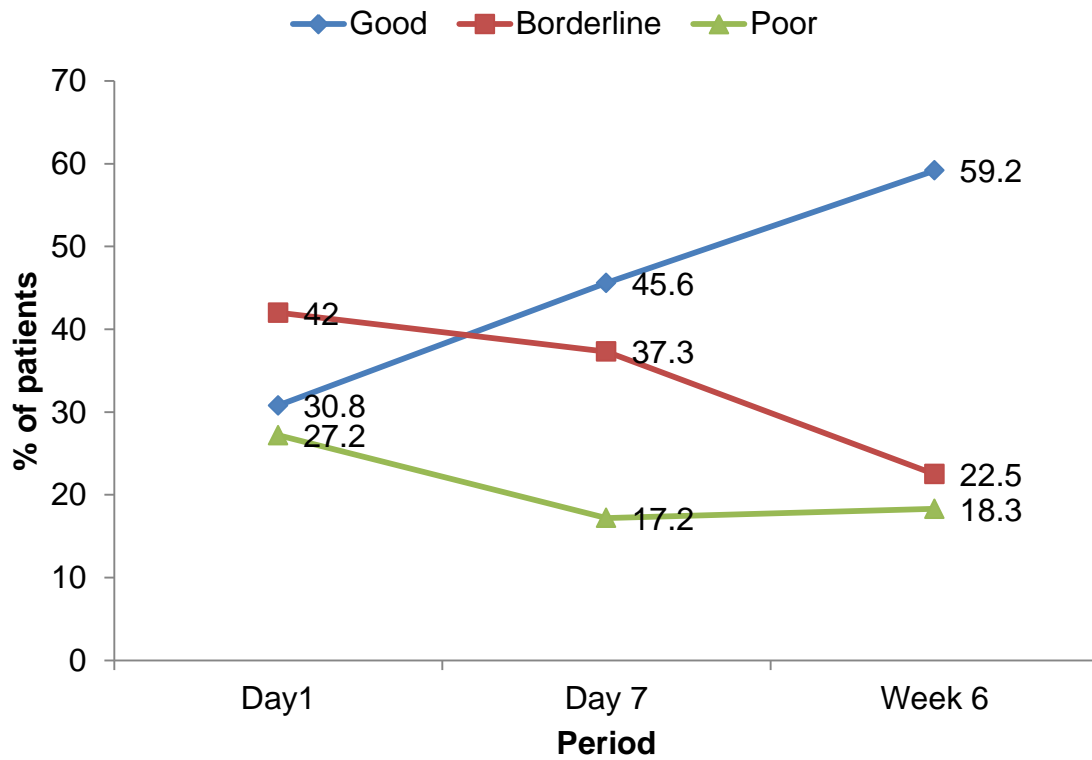


Figure 5: Corrected visual Acuity with pinhole for 1st, 7th and 6 week period (n=169 eyes)

Most of the eyes had visual acuity between $6/18-6/60$ (borderline visual outcome) on the 1st day post-operative. The visual outcome increased to good (VA between $6/6-6/18$) on 7th day and 6th weeks post-operatively.

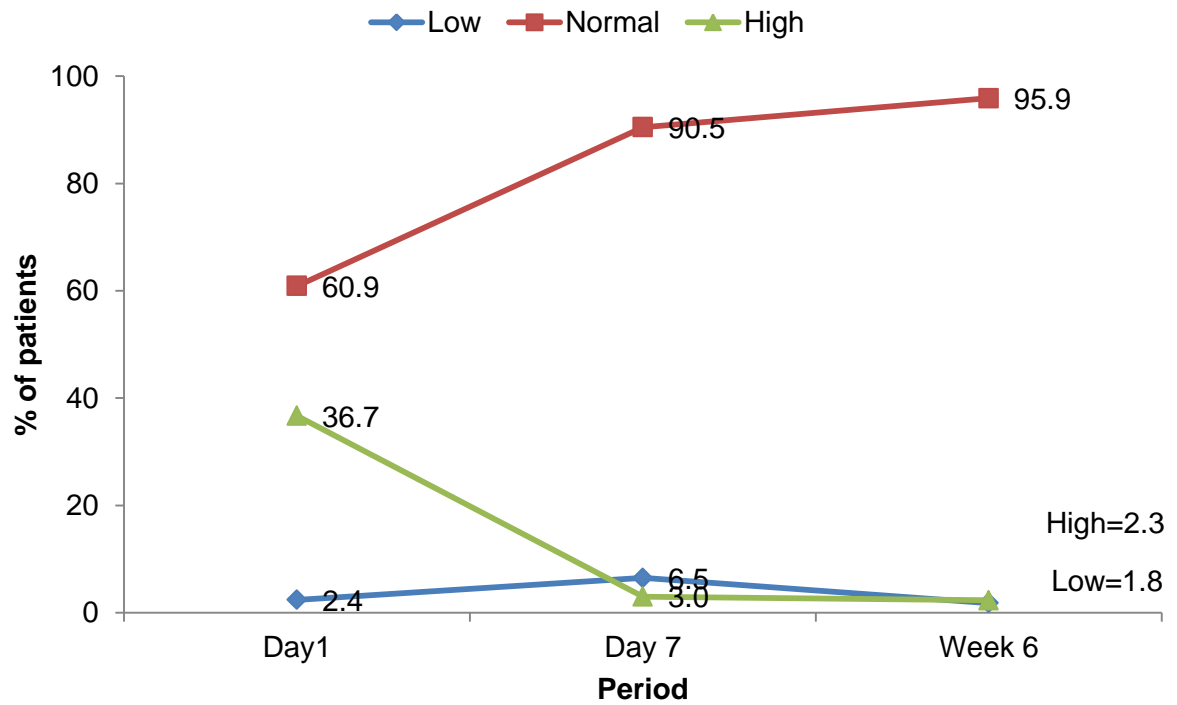


Figure 6: Intraocular pressure for 1st, 7th and 6 week period (n=169 eyes)

Most of the eyes had normal intraocular pressure of 10-20mmhg in the 1st day, 7th day and 6th week post-operative.

Table 4: Intra operative complications (n=44 eyes)

Complication	Number	%
Iris prolapse	24	54.5
Posterior capsule tear	23	52.3
Vitreous loss	14	31.8
Zonular dialysis	6	13.6
Desment membrane peeling	2	4.6
Hyphema	2	4.6

*Total frequency may exceed N due to multiple events per eye.

The commonest intra-operative complications were iris prolapse (54.5%) and posterior capsule tear (52.3%). (Table 4)

Table 5: Post-operative complications at 1st day (n=85 eyes)

Complication	Number	%
Corneal edema	76	89.4
Elevated IOP	62	72.9
Iris prolapse	1	1.2
Pupillary capture	1	1.2

*Total frequency may exceed N due to multiple events per eye.

Corneal edema 76(89.4%) and elevated intraocular pressure 62 (72.9%) was the commonest complications that was seen on the 1st day post-operative. (Table 5)

Table 6: Post-operative complications at 7th (n=38 eyes) day and 6th week (n52 eyes) by professional level of the surgeon

Complication	7 th day, n=38		Total n (%)	6 th week, n= 52		Total, n (%)
	Specialist	Resident		Specialist	Resident	
Shallow A/C	0	1	1(2.6)	0	1	1(1.9)
Elevated IOP	0	4	4(10.5)	0	4	4(7.6)
Corneal oedema	0	19	19(50.0)	0	4	4(7.6)
PCO	2	10	12(31.6)	9	31	40(76.9)
IOL dislocation	0	3	3(7.9)	0	3	3(5.8)
Uveitis	0	5	5(13.2)	0	1	1(1.9)
Retinal detachment	0	0	0(0.00)	0	1	1(1.9)
Macula oedema	0	0	0(0.00)	0	3	3(5.8)

*Total frequency may exceed N due to multiple events per eye.

Corneal oedema 19(50%) and posterior capsule opacification 40 (76.9%) were the commonest complications that were seen on 7th day and 6th weeks respectively. (Table 6)

Table7: Post-operative refraction on 6th weeks (n=160 eyes)

	number	%
Ametropia	127	79.4
Emmetropia	33	20.6
Type of refractive error		
Hyperopia	22	13.8
Myopia	48	30.0
Astigmatism	57	35.6

Hundred and twenty seven eyes (79.4%) had post-operative refractive error. Astigmatism 57 (35.6%) was the most common type of refractive error. (Table 7)

Table 8: Causes of poor visual outcome (n=29 eyes)

Causes	Number	%
Comorbidities	9	31
Type of comorbidity		
ARMD	1	3.4
Diabetic retinopathy	3	10.3
Optic atrophy	4	13.8
HIV	1	3.5
Intraoperative complication	9	31.0
Residual refraction	3	10.4
Post-operative complications	8	27.6

*Total frequency may exceed N due to multiple events per eye.

The commonest cause of poor visual outcome was ocular comorbidity 9(31%) and intra-operative complications 9(31%). (Table 8)

Table 9: Bivariate analysis to assess factors associated with poor visual outcomes at 6 weeks post operation

Factor	Total, n(%)	With poor VA, n(%)	Chi-Square	P-Value
Sex				
Male	100(59.2)	22(22.0)	2.187	0.139
Female	69(40.8)	9(13.0)		
Age group				
≤50	20(11.8)	2(10.0)	1.054	0.305
>50	149(88.2)	29(19.5)		
Occupations				
Employed/self employed	84(49.7)	15(17.9)	0.068	0.795
Peasant	45(26.6)	8(17.8)		
Others(unemployed, retired)	40(23.7)	8(20.0)		
Education				
No formal education/primary	103(60.9)	21(20.4)	0.736	0.391
Secondary and above	66(39.1)	10(15.2)		
Type of cataract				
Nuclear	90(53.3)	12(13.3)	3.471	0.062
PSC	33(19.5)	7(21.2)		
Others	46(27.2)	12(26.1)		
Surgeon level				
Specialist	48(28.4)	2(4.2)	8.995	0.003
Resident	121(71.2)	29(24.0)		
Suture				
Yes	77(45.6)	21(27.3)	7.53	0.006
No	92(54.4)	10(10.9)		
Intra-op complications				
Yes	44(26.0)	16(36.4)	12.897	<0.0001
No	125(74.0)	15(12.0)		
Ammetropia				
Yes	106(62.7)	27(25.5)	9.647	0.002
No	63(37.3)	4(6.3)		
Post op complications				
Yes	136(80.5)	31(22.8)	9.212	0.002
No	33(19.5)	0(0.0)		
Co-morbidity				
Yes	15(9.9)	11(73.3)	33.232	<0.0001
No	154(91.1)	20(13.0)		

With bivariate analysis, the factors related to poor surgical outcome were; the level of the surgeon, presence of suture in the wound, intra-operative complications, refractive error, post-operative complications and presence of comorbidities. (Table 9)

Table 10: Unadjusted and adjusted analysis to assess factors associated with poor visual outcomes at 6 weeks post operation (VA with pinhole)

Factor	Unadjusted OR	P-value	Adjusted OR	P-value
Sex				
Male	1.9(0.8-4.4)	0.143	2.2(0.8-6.2)	0.133
Female	Ref		Ref	
Type of cataract				
Nuclear	Ref		Ref	
PSC	1.8(0.6-4.9)	0.288	2.3(0.6-8.3)	0.200
Others	2.3(0.9-5.6)	0.069	1.8(0.6-5.5)	0.308
Surgeon				
Specialist	Ref		Ref	
Resident	7.2(1.7-31.7)	0.009	4.6(0.7-30.3)	0.115
Suture				
Yes	3.1(1.4-7.0)	0.008	1.0(0.3-3.0)	0.960
No	Ref		Ref	
Intra-op complications				
Yes	4.2(1.9-9.5)	0.001	5.1(1.6-16.3)	0.010
No	Ref		Ref	
Co-morbidity				
Yes	18.4(5.4-63.5)	<0.0001	43.4(9.0-210.1)	<0.0001
No	Ref		Ref	
Post op complications				
Yes	5.0(1.7-15.2)	0.004	3.7(0.8-17.8)	0.107
No	Ref		Ref	

In Adjusted logistic analysis; intraoperative complications (AOR=4.7; 95%CI 1.4-15.2) and ocular comorbidity (AOR=18.4; 95%CI 8.9-224.1) were the factors that significantly associated with poor visual acuity. (Table 10)

CHAPTER FOUR

4.0 DISCUSSION

The results of this study showed that most patients were more than 50 years of age because cataract is an age related condition. This finding is similar to other studies done in China, Nigeria and Kenya (23,25,34). Results also showed that there were more males than females which is similar to other studies in Africa(21,25). This can be explained by most males engage in income generating activities and as such financially capable to seek health care in many African societies. About 80% of the patients were from Dar-es-salaam region. This is because Muhimbili National Hospital is the tertiary level hospital in the country which provides eye care services and is located in Dar es Salaam region. Patients close to the hospital can easily access services than patients from other regions outside the city.

In this study all eyes were blind with visual acuity $<3/60$ or less pre-operatively. Similar findings were seen by Ilechie, Lindfield and Karimurio (12,22,35). The Late presentation to the hospital is a reason of the patients to be blind pre-operatively. This can be related to poor affordability, poor access and poor awareness among patients. More than half of the surgeries were performed by residents, it is because MNH is a teaching hospital therefore residents are given more patients to operate so as to learn and acquire surgical experience.

Results showed that on the first post-operative day, 23.7% and 28.4% of eyes achieved good visual outcome (VA=6/6-6/18) and poor visual outcome (VA= $<6/60$) respectively. This finding was similar to that of Ilechie et al which recorded 29.2% poor outcome with in 48hours and good outcome in 22% on day one (22) and Olawoye et al who recorded good outcome in 13% and poor outcome in 33.2% in the first day post-operative (21). This was largely due to corneal edema which is caused by mechanical injury to the cornea by touching the corneal endothelium and excessive irrigation. Consequently the cornea became hazy interfering with vision. However as the days goes on the corneal edema is expected to clear off and make the patient to see clearly but sometimes it may not clear and lead to corneal

decompensation as seen in Claesson et al (36). Therefore the proportion of good visual outcome improved from 40(23.7%) in 1st day to 63(37.3%) in 6th week post-operatively.

The best corrected visual acuity 6weeks post-operative are far below WHO recommendations which recommends >90% to be good, borderline <5% and poor <5% (10). Results of this study showed 65.1% good and 17.2% poor outcome. This was lower than Sudhir et al (20) and Olawoye et al (21),which recorded good in 86.42% and 78.8% and poor in 1.92% and 3.8% respectively. The reason of such low WHO standard was contributed by the presence of intraoperative complications which made some patients to be left aphakic, presence of late complications like posterior capsule opacification, corneal decompensation and macular edema. Other reasons were due to presence of ocular comorbidities and refractive error. To improve visual outcome the surgeon must evaluate thoroughly the patients prior the surgery, close supervision of the residents during surgery for timely management of intraoperative complications and regular follow up of the patients post operatively so as to monitor and manage the complications on time.

Results of our study showed that intra-operative complications occurred in about 44(26%) eyes. These were higher than what was reported by Sudhir et al (17) and Trivedy et al (23). The findings in this study were probably contributed by less experience of the surgeons since more than half of the surgeries were performed by residents. Corneal edema and elevated intraocular pressure were the commonest early post-operative complications similar to what was seen by Trivedy et al (23,37). High intra ocular pressure could result from incomplete aspiration of viscoelastic material from anterior chamber leading to blocking outflow of aqueous humour. There was a decrease in both corneal edema and intraocular pressure with time and proper management. Posterior capsule opacification was the commonest late post-operative complication similar to Isawumi et al (18,25). This was probably contributed by left out of anterior epithelial cells during surgery that grow to the posterior capsule causing thickening of the capsule. To reduce these complications, the surgeons should ensure that complete irrigation and aspiration is performed during the surgery so as to prevent the of rise intra ocular pressure after surgery.

Despite biometry being done to all patients pre operatively, it was still found that 79.4% of the patients had residual refractive error at week 6 post-operatively. This indicates that the IOL powers implanted were not very accurate which was similar to findings by Kumar et al (18,28). Most of the eyes 57 (44.9%) had astigmatism. This is probably related to the fact that most of the wounds were sutured and the sutures were not removed up to the time of refraction thereby distorting the corneal curvature. It has been recommended by Cook Collin that timely suture removal is important in order to minimize astigmatism (14). Residual myopia was found in 37.8% and hyperopia was found in 17.3% of operated eyes. This was probably due to inadequate of appropriate required IOL powers. Consequently sometimes powers of inserted IOLs were approximated only.

There were several factors which were associated with poor visual outcome including the experience of the surgeon. Most of the surgeries were done by less experienced surgeons therefore the chances of getting complications that contributed to poor outcome was higher. The findings of this study was similar to Rajiv et al and Ejimadu et al (24,38). Intra operative complication was another factor that contributed to poor outcome similar to Lindfield et al (12). This is due to the fact that having posterior capsule tear and vitreous loss made surgeons not to insert IOL in some of the patients hence poor outcome. Also having post- operative complications contributed to poor outcome particularly to the patients who had corneal decompensation, macular edema, retinal detachment and posterior capsule opacification.

Having refractive error was also a factor contributed to poor outcome which was the same to Gupta et al and Lindfield et al (12,39) . The study has found that 10% of the eyes had astigmatism which was probably caused by intra ocular lens tilt. Another factor was due to presence of ocular comorbidities. Several studies found the same findings (12,18,27,28). Optic atrophy was the leading ocular comorbidity that was seen in 13.8%. This differs to Olawoye et al (21) who found glaucoma to be the commonest ocular comorbidity. The reason of having ocular comorbidities as a cause of poor outcome was due to poor selection of the patients for surgery. However with adjusted logistic analysis, intra-operative complications and ocular

comorbidities were the only factors that were significantly associated with poor surgical outcome.

CHAPTER FIVE

5.0 CONCLSION AND RECOMMENDATIONS

5.1 CONCLUSION

The cataract visual outcome at Muhimbili National Hospital was low and was below WHO standards. The commonest intra-operative complications were iris prolapse and posterior capsule tear. Early complications were corneal edema and high intraocular pressure. The commonest late complication was posterior capsule opacification. Astigmatism was the commonest residual refractive error. The factors associated with poor outcome were mainly presence of intraoperative and post-operative complications and ocular comorbidity.

5.2 RECOMMENDATIONS

1. Measures to improve post-operative visual outcome include good pre-operative evaluation and proper selection of patients for surgery to minimize poor outcome.
2. Method to polish posterior capsule during surgery need be employed in order to avoid posterior capsular opacity.
3. Further studies on looking at refractive errors and biometry to identify the reasons for residual refractive errors.
4. Establish a cataract surgery monitoring tool at MHN so as to assess the outcome and quality of the surgeries that are conducted in the hospital.

5.3 STUDY LIMITATIONS

1. Loss to follow-up the patients.
2. B scan was not performed to all patients prior to surgery to note the posterior segment disorders as the cause of poor outcome.

5.4 STUDY MITIGATIONS

1. Phone numbers of the patients were taken by principal investigator for reminding patients who did not show up at the clinic on appointed dates.
2. Extra number of patients was recruited to meet the sample size.

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APPENDICES

APPENDIX I: QUESTIONNAIRE

VISUAL OUTCOME AFTER SMALL INCISION CATARACT SURGERY AMONG ADULTS PATIENTS AT MUHIMBILI NATIONAL HOSPITAL

PID _____

Registration No.

SECTION A: DEMOGRAPHIC INFORMATION

(Circle or fill in spaces provided)

QNumber	Question and answer	Code
1.	Names of patient (initials).....	N/A
2.	Age: _____	N/A
3.	Sex: 1. Male 2.Female	
4.	District of residence 1.Ilala 2.Kinondoni 3.Temeke 4.Others	
5.	Occupation: 1.Peasant 2. Employed 3. Self-employed/Business 4. Un-employed 5. Student 6. Retired 7. Others	
6.	Education: 1. Illiterate 2.Primary 3.Secondary 4.College/ university	

CORMOBIDITY

QNumber	Question and answer	Code
1.	Diabetes: 1. Yes 2.No	
2.	Hypertension: 1. Yes 2.No	
3.	Glaucoma: 1.Yes 2.No	
4.	HIV: 1. Yes 2.No	
5.	Optic atrophy 1.Yes 2. No	

6.	ARMD	1. Yes	2. No	
7.	Other			

SECTION B: SURGICAL INFORMATIONS

Pre op examinations:

Operated eye 1. RE

2. LE

Q. Number		
7.	VA :	
8.	Biometry: 1 Yes 2. No	
9.	IOP : _____	
10.	Eyelids: 1.Normal 2.Other _____	
11.	Conjunctiva: 1.Normal 2.Other _____	
12.	Corneal: 1.Normal 2.Other _____	
13.	A/C: 1.Normal 2.Other _____	
14.	Iris: 1.Normal 2.Other _____	

15.	Pupil : 1.Normal 2.Other_____	
16.	Type of cataract: 1. Nuclear 2. Cortical 3. PSC 4. Hypermature 5. Other_____	
17.	Vitreous: 1.Normal 2.Other_____	
18.	Fundus: 1.Normal 2.Other_____	
19.	Surgeon: 1.Specialist 2.Resident	
20.	Anesthesia: 1.Local 2.GA	
21.	Type of IOL: 1. Hard 2. Soft	
22.	IOL position: 1. In the bag 2. In the sulcus 3. A/C 4. None	
23.	Suture: 1.Yes 2. No	
24.	Incision 1.Superior 2. Temporal	

SECTION C: COMPLICATIONS

S/N	Question and answer	Code
25.	Pre op complications: 1. Yes 2. No	
26.	a) If qn 25 Yes 1. Retrobulbar hemorrhage 2.Others	
	b) If Other specify _____	
27.	Intra op complications 1. Yes 2. No	
28.	If yes specify the complication below	
	a) Posterior capsule tear 1. Yes 2. No	
	b) Iris prolapsed 1. Yes 2. No	
	c) Iridodialysis 1. Yes 2. No	
	d) Vitreous loss 1. Yes 2. No	
	e) Hyphema 1. Yes 2. No	
	f) Zonular dialylis 1. Yes 2. No	
	g) Lens matter in the vitreous 1. Yes 2. No	
	h) Other.....	
29.	Post-op complications at 1st day 1. Yes 2. No	
30.	If yes specify the complication below	
	a) Shallow A/C 1. Yes 2. No	
	b) Elevated IOP 1. Yes 2. No	
	c) Corneal edema 1. Yes 2. No	
	d) Wound leaking 1. Yes 2. No	

	e) IOL dislocation	1. Yes 2. No	
	f) Endophthalmitis	1. Yes 2. No	
	g) Iris prolapse	1. Yes 2. No	
	h) Pupillary capture	1. Yes 2.No	
	i) Other.....		
31.	At 7th day	1. Yes 2. No	
32.	If yes specify the complication below		
	a) Shallow A/C	1. Yes 2. No	
	b) Elevated IOP	1. Yes 2. No	
	c) Corneal edema	1. Yes 2. No	
	d) PCO	1. Yes 2. No	
	e) IOL dislocation	1. Yes 2. No	
	f) Endophthalmitis	1. Yes 2. No	
	g) Uveitis	1. Yes 2. No	
	h) Retinal detachment	1. Yes 2. No	
	i) Macula edema	1. Yes 2. No	
	j) Other.....		
33.	At 6th week	1. Yes 2. No	
	a) Shallow A/C	1. Yes 2. No	
	b) Elevated IOP	1. Yes 2. No	
	c) Corneal edema	1. Yes 2. No	
	d) PCO	1. Yes 2. No	
	e) IOL dislocation	1. Yes 2. No	
	f) Endophthalmitis	1. Yes 2. No	
	g) Uveitis	1. Yes 2. No	
	h) Retinal detachment	1. Yes 2. No	
	i) Macula edema	1. Yes 2. No	
	j) Other		

SECTION D: POST OPERATION VISUAL ACUITY

S/N	Question and answer			
34.	Visit	i) VA without pinhole	ii) VA with Pinhole	iii) IOP
	a)Day 1	1. 6/ 6- 6/18 2.<6/18 - 6/60 3.<6/60	1. 6/ 6- 6/18 2.<6/18 - 6/60 3.<6/60	1.<10 2.10-20 3.>21
	b)Day 7	1. 6/ 6- 6/18 2.<6/18 - 6/60 3.<6/60	1. 6/ 6- 6/18 2.<6/18 - 6/60 3.<6/60	1.<10 2.10-20 3.>21
	c)Week 6	1. 6/ 6- 6/18 2.<6/18 - 6/60 3.<6/60	1. 6/ 6- 6/18 2.<6/18 - 6/60 3.<6/60	1.<10 2.10-20 3.>21

35.	BCVA at 6th week	
	1. 6/ 6- 6/18 2.<6/18 - 6/60 3.<6/60	

SECTION E: REFRACTION

36.	Refraction	Prescription	Code
	a) Ametropia		
	b) Hyperopia	1. <3 DS 2. >3 DS	
	c) Myopia	1. <3 DS 2. >3 DS	
	d) Astigmatism	1. <1 DC 2. >1 DC	

SECTION F: THE CAUSES OF POOR VISUAL OUTCOME

37.	Comorbidity	1. Yes	2. No	
	a) Glaucoma	1. Yes	2. No	
	b) ARMD	1. Yes	2. No	
	c) Diabetic retinopathy	1. Yes	2. No	
	d) Optic atrophy	1. Yes	2. No	
	e) HTN retinopathy		1. Yes 2. No	
	f) Other_____			
38.	Surgery (intra-op complications)	1. Yes	2. No	

39.	Residual refraction	1. Yes 2. No	
40.	Post op complications	1. Yes 2. No	

END

APPENDIX II: CONSENT FORM ENGLISH VERSION

Dear sir/Madam

My name is Dr Condrada Ngonyani, a resident in department of Ophthalmology at MUHAS.I have been authorized by MUHAS research committee and MNH to conduct a research as a necessary requirement for fulfillment of my post graduate studies.

Title: Visual outcome after manual small incision cataract surgery among adult patients at Muhimbili National Hospital from May 2017 to January 2018.

This study is aimed to assess the post-operative visual outcome among adult patients operated for small incision cataract surgery at Muhimbili National Hospital.

Confidentiality: All information collected in questionnaires and hospital register will not be disclosed to any one not related to this study. Initial of your names will be used and results will be presented as overall reflection of the community and not as a report of an individual.

Risk: There will be no risk associated with this study.

Benefit: your participation will help to improve the service to patients with cataract; also you will be able to gain information pertaining to surgery performed and detection of other eye disorders during the study period.

Rights to withdraw: taking part in this study is completely voluntary and refusal to participate or withdrawal will not involve penalty or loss of any benefits to which you're entitled.

Who to Contacts: For any question about this study you can contact me investigator Dr

Condrada Ngonyani

Phone: 0688913424

P.O.BOX 65001, Dar es salaam

E-mail: condradah@gmail.com

OR

My supervisor DR Milka Mafwiri (Lecturer MUHAS, senior consultant ophthalmologist)

Phone: 0784323250

If you have any question concerning your rights as a participant you may contact

Director of Research and Publication Prof. A. Pembe

Phone; 2150302/6

P.O.BOX 65001

MUHAS

APPENDIX III: FOMU YA RIDHAA YA KUSHIRIKI KATIKA UTAFITI

Habari

Naitwa Dkt Condrada Ngonyani, ni mwanafunzi wa shahada ya udhamili katika chuo kikuu cha Afya na sayansi shirikishi Muhimbili, idara ya magonjwa ya macho. Nina fanya utafiti kuhusu kiwango cha kuona baada ya upasuaji wa kutolewa mtoto wa jicho.

Lengo kuu la utafiti huu ni kutathmini kiwango halisi cha uono baada ya upasuaji wa mtoto wa jicho, Pia ni hitaji la lazima ili niweze kukamilisha masomo yangu.

Jinsi ya kushiriki Katika utafiti huu

Ukikubali kushiriki, utahojiwa kwa kutumia dodoso kwa lugha ya Kiswahili. Na pia utafanyiwa vipimo vya macho. Utahitajika pia kuudhuria kliniki ya macho kwa kipindi cha baadaya wiki moja na baadaya wiki sita ili kujua maendeleo ya uono wako.

Usiri

Usiri baina ya mgonjwa na mtafiti utahakikishwa kipindi chote cha utafiti. Majina hayatatumika bali namba. Taarifa zitakazo kusanywa zitatumika kwa madhumuni ya utafiti huu tu.

Madhara

Hakuna madhara yeyote yanayo tegemewa kujitokeza kwa kushiriki kwako.

Haki ya kushiriki

Hakuna shuruti yoyote juu ya ushiriki wako katika utafiti huu. Una uwezo wa kukubali ama kukataa bila kutoa sababu zozote za kufanya hivyo. Na ukikubali unaweza kubadili uamuzi wako ukijisikia kufanya hivyo wakati wowote. Uta endelea kupatiwa matibabu na huduma kama wagonjwa wengine.

Faida za kushiriki

Ushiriki wako uta saidia namna ya kuboresha huduma kwa wagonjwa wenye mtoto wa jicho. Pia uta faidika kwa kupata huduma ya kuchunguzwa macho yako na kutibiwa tatizo lolote litakalo gunduliwa wakati wa utafiti huu.

Mawasiliano

Endapo utakuwa na maswali au maoni juu ya utafiti huu, wasiliana na

1. Dkt Condrada Ngonyani (068893424), condradah@gmail.com
2. Dkt Milka Mafwiri
0784323250
Msimamizi wa utafiti

Kama una maswali kuhusu haki yako kama mshiriki wasiliana na mkurugenzi idara ya utafiti , Prof. A. Pembe ,P.O.BOX 65001 ,MUHAS. Simu 2150302/6

Tamko la Mshiriki

Mimi.....nime soma/nime

somewa na kuelewa kilichoelezwa kwenye fomu hii na maswali yangu yame jibiwa kiufasaha.

Hivyo nina kubali kuhojiwa na kufanyiwa uchunguzi kwa ajili ya utafiti huu.

Saini ya mhojiwa.....Tarehe.....

Saini ya mhoji.....Tarehe.....

APPENDIX IV: VISUAL ACUITY CHARTS

The World Health Organization visual acuity definition (33)

Category	Corrected VA-better eye	Definition
0	6/6-6/18	Normal
1	<6/18-6/60	Visual impairment
2	<6/60-3/60	Severe visual impairment
3	<3/60-1/60	Blind
4	<1/60-PL	Blind
5	No perception of light	Blind

WHO cataract surgery visual outcome definition (10)

Post-operative acuity		With available correction	With best correction
Good	6/6-6/18	>80%	>90%
Borderline	<6/24-6/60	<15%	<5%
Poor	<6/60	<5%	<5%

WORK PLAN

	Jan-March 2017	March- May2017	May 2017 - March 2018	March 2018 - May 2018
Proposal writing and submission for correction				
Ethical clearance and funding process				
Data collection, processing and analysis.				
Report writing and submission				