CAUSES OF BLINDNESS AND SEVERE VISUAL IMPAIRMENT AMONG STUDENTS ATTENDING SCHOOL FOR THE BLIND IN BEIRA, MOZAMBIQUE

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A THESIS PROPOSAL SUBMITTED TO THE UNIVERSITY OF NAIROBI, DEPARTMENT OF OPHTHALMOLOGY IN PARTIAL FULFILLMENT FOR THE AWARD OF DEGREE OF MASTER IN MEDICINE (OPHTHALMOLOGY)

DECLARATION

I declare that this thesis proposal is my original work and has not been presented for the award of a degree in any other university.

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DEDICATION

To my late parents and family for the continuous support, encouragement and patience given to me while undertaking my studies.

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ABBREVIATIONS

BL - Blindness

CNS - Central Nervous System

IAPB - International Agency for the Prevention of Blindness

IMR - Infant Mortality Rate

HTEM – Harmful Traditional Eye Medicine

RAAB - Rapid Assessment of Avoidable Blindness

SDGs - Sustainable Development Goals/Global Goals

SPSS - Statistical Program for Social Sciences

SSA - Sub-Sahara Africa

SVI - Severe Visual Impairment

U5MR -Under 5 mortality rate

V2020 - Vision 2020

VA - Visual Acuity

VAD - Vitamin A Deficiency

VI - Visual impairment

WHO - World Health Organization

ABSTRACT

Background/Introduction: The World Health Organization defines low vision as visual acuity of less than 6/18, but equal to or better than 3/60), or visual field loss to less than 20 degrees, in the better eye with best possible correction. Blindness is defined as visual acuity of less than 20/400 (3/60), or a visual field loss to less than 10 degrees, in the better eye with best possible correction.

Objectives: The overall objective of this study is to determine the causes of severe visual impairment (SVI) and Blindness (BL) among students attending schools for the blind in Beira, Mozambique. The specific objectives were to: (i) determine the anatomical and etiological causes of BL/SVI, and (ii) determine possible avoidable causes of BL/SVI.

Study design: Descriptive cross-sectional study.

Method: Ninety-nine students attending the schools for the blind in Beira Mozambique were interviewed and examined using the Modified WHO/PBL Eye Examination Record for Children with Blindness and Low Vision Form.

Results: The study established that a majority of the anatomical factors related to BL/SVI, whole globe pathology accounting for 39.6% of the cases, while those affecting the cornea were 34.1%, optic nerve 12.3%,lens 6.%, uvea 2.2%, and retina 1.1%. This finding leads to an understanding that the most common cause of BL/SVI are those that affect the whole globe and the cornea. By etiological classification, 33% of the etiological factors causing BL/SVI were postnatal factors, 10.9 % were perinatal, 10 % were intrauterine and in 46.1% the etiology was nonspecific. And 71.4% of the causes of BL/SVI were potentially avoidable.

Conclusions: A high proportion of childhood blindness in schools for the blind in Beira Mozambique is avoidable. The major anatomical site of BL/SVI were phthisis and cornea scar. The childhood factors (measles, harmful traditional practices and vitamin-A deficiency) were the main underling etiology causes.

The study emphasizes the importance of awareness increasing among the public and specialist pediatric ophthalmologist in the management of childhood eye diseases in Mozambique.

CHAPTER ONE: INTRODUCTION

1.1 Definition of Visual Impairment/Blindness

According to WHO, Blindness (BL) is defined as best corrected vision of less than 3/60 in the better eye or a visual field no greater than 10° in radius around central fixation.[1]

Low vision is defined as visual acuity of less than 6/18 but equal to or better than 3/60 or a corresponding visual field loss to less than 20^{o} in the better eye with best possible correction.

Visual Impairment (VI) includes both blindness and low vision.

Severe Visual Impairment (SVI) is defined as best corrected visual acuity worse than 6/60 but better or equal to 3/60 in the better eye.

Based on recommendations from WHO study group on the prevention of blindness, visual impairment has been divided into six strata by the International Statistical Classification of Diseases and Related Health Problems, 10th revision (ICD-10)[2] (Appendix III).

1.2 Global Blindness

The new global estimate of visual impairment (reported in a 2006 WHO press release) was based on presenting vision rather than best corrected vision[1,3]. According to the revisedICD-10 categories and definition of BL/SVI formulated in Geneva in 2003, blindness is defined as presenting vision of less than 3/60 or a visual field of the better eye no greater than 10° in radius around central fixation[4].Based on this definition there are 314 million people with Visual Impairmentglobally[3].

In 2002 estimates, the number of visual impairment people was put at 161 million. The newer estimates nearly double this with the addition of 153 million cases of uncorrected refractive error of whom 8 million are thought to be blind[1,3]. According to WHO Global Data on Visual Impairments (2010) the 1^{st} cause of blindness globally is cataract, which accounts for 51%; followed by undetermined cause accounting for 21%; RE contributes for 3% of blindness[26].

1.3: Child and Childhood Blindness

According to the UNICEF definition, a child is defined as an individual whose age is less than 16 years[3]. Childhood blindness refers to diseases or conditions that happen in early life, that lead to blindness. Childhood blindness can't always be treated in the same way as adult blindness, as a child's eye is smaller and less developed. Specialist training and equipment is often required.

1.4: VISION2020 and Control of Childhood Blindness

Childhood blindness is one of the five ocular conditions established as immediate priorities for control by the collaboration between the International Agency for the Prevention of Blindness (IAPB) and WHO that is known as vision2020: The Right to Sight. Vision2020 is the global initiative for the elimination of avoidable blindness by the year 2020.Unlike in adults, only about fifty percent of all childhood blindness is avoidable[5].The major preventable causes include Vitamin A Deficiency (VAD), measles, trachoma, harmful traditional eye medicines and ophthalmia neonatorum. Cataract, glaucoma and retinopathy of prematurity are common surgically treatable causes of childhood blindness. The vision 2020 initiative aims to reduce the prevalence of blindness in children from the present 0.75 per 1000children to 0.40 per 1000 children by the year 2020[5].

CHAPTER TWO: LITERATURE REVIEW

2.1 Magnitude of Childhood Blindness

2.2.1 Worldwide

It is estimated that there are about 1.4 million blind children in the world and the prevalence of childhood blindness ranges from 0.3/1000 children age less than 16 years in the wealthiest countries up to 1.5/1000 children in very poor countries. This makes the overall prevalence of childhood blindness 0.75 per one thousand children[6´7].

Worldwide, about half a million children become blind each year, nearly one per minute. Most of this blindness occurs in children living in the sub Saharan and Asian countries. Many of these children die in their childhood from the underlying causes of blindness such as measles, vitamin-A deficiency, meningitis, rubella, prematurity, genetic diseases and head injuries[5´6].

Childhood blindness accounts for 3.2 percent of the burden of global blindness[1´5]. Childhood blindness is one of the initial five priority areas of the IAPB/WHO vision 2020, the Right to Sight initiative, a global campaign for the elimination of avoidable blindness by the year 2020[6].

2.2.2 Africa

The poorest regions of Africa and Asia are where three quarters of the world blind childrenlive[6]. Out of the 1.4 million blind children globally, about 300,000 live in Africa. The prevalence of blindness in children in a country is related to the nutritional, health and socioeconomic status of that country and hence the Under 5 Mortality Rate (U5MR). It is estimated that countries with U5MR in excess of 170/1000 have a prevalence of childhood blindness in excess of 0.1%, while those with U5MR below 30/1000 probably have a prevalence of 0.02-0.05% children[8´9].

The difference in prevalence of childhood blindness between the richest and the poorest countries of the world may be as high as ten-folds (0.1/1000 versus 1.1/1000)[6]. According to studies made at different countries in schools for the blind, majority of blindness in children in Africa are due to avoidable causes[8´10].

2.2: Causes of Childhood Blindness

There are two ways of classifying the causes of blindness in children: anatomical and etiological. The anatomical way of classification depends on the most affected part of the eye and is useful as information can be collected on all children. The etiological classification on the other hand is useful for planning preventive measures in large scale in a population but obtaining reliable data is more difficult[6].

2.2.1. Anatomical causes of blindness and severe visual impairment in children

Causes of blindness in children vary from region to region depending on the socioeconomic development of countries. In the poor countries of Africa and Asia corneal scarring (mainly from vitamin-A deficiency), cataract and glaucoma are the major causes of childhood blindness. But in affluent countries genetic eye diseases, ocular anomalies and CNS lesions are the predominant causes of childhood blindness.

Kello and Gilbert[10] conducted a study to determine the causes of severe visual impairment and blindness in children in schools for the blind in Ethiopia. The study found that out of 360 students examined 295(94.5%) were blind or severely visually impaired. The major anatomical site of visual loss was cornea/phthisis (62.4%), followed by optic nerve lesions (9.8%), cataract/ aphakia (9.2%), and lesions of the uvea (8.8%).

Another study conducted in Ethiopia to determine the magnitude and causes of childhood blindness (BL)/Severe Visual Impairment (SVI) found that out of 112 children 36 (32%) were blind/SVI. The district prevalence of childhood blindness/SVI was 0.062% (95% CI 0.042-0.082). The anatomical causes of BL/SVI were lens-related in 33% (12 cases), cornea in 28% (10 cases), whole globe [glaucoma in 11% (4 cases) and phthisis bulbi in 8% (3 cases), refractive error in 17% (6 cases) and optic nerve in 3% (1 case).

Ruhagaze[11] conducted a study to determine the causes of blindness and severe visual impairment (BL/SVI) among students attending schools for the blind in Burundi in 2011. A total of 117 students who became visually impaired before the age of 16 years were examined. The study found out that 93.2% students were blind or severely visually impaired. The major anatomical causes of BL/SVI were cornea abnormalities/phthisis (23.9%), followed by lens abnormalities (18.3%), uveal lesions (14.7%) and optic nerve lesions (11.9%). In the majority of students with BL/SVI, the underlying etiology of visual loss was

unknown (74.3%). Ruhagaze conclude that the causes identified indicate the importance both of preventive public health strategies and of specialist pediatric ophthalmic services in the management of childhood blindness.

Many studies have been done in Africa to ascertain the causes of childhood blindness. In East Africa, the major causes were corneal pathology accounting for 35.2%, cataract 13.5%, and retina 14.8 %[12,13]. In Malawi, Kalua et al estimated the anatomical causes of childhood blindness to be lens related 13(35%), cornea related 8(22%), refractive error 4(11%), squint and amblyopia 4(11%), retina 3(8%), cortical blindness 2 (5%)[14] . Demissie and Solomon did similar study in Southern Ethiopia and estimated the magnitude of childhood blindness to be 0.062% and most of the causes of childhood blindness was due corneal pathology 10(28%). Lens 12 (3%), whole globe 7(19%) and optic nerve 1(3%)[15].

In Liberia 2009 a similar study was done in Liberia to estimate the magnitude and causes of childhood blindness and the study identified 57 children who were either blind in one or both eyes. It estimated the prevalence of childhood blindness as 0.05 %(95% CI0.03-0.08). The single cause of blindness was corneal pathology 35 % (95%CI15.5%-59.2%) due to trauma. About 84.2% all the blindness were avoidable[16].

2.2.2 Etiological causes of blindness and severe visual impairment in children

Underlying etiologies of BL/SVI are classified in four major categories according to the time of onset of the insult resulting in visual loss: hereditary factors, intrauterine factors, perinatal factors and childhood factors[2].

In most of the countries, the underlying etiology cannot be determined in a significant proportion of cases. In most children this is because it's not possible to determine the time of onset owing to lack of reliable history and medical records, or the pathological processes cannot be elucidated[17].

Among the known etiologies, childhood factors constitute the major etiology of blindness especially in countries with poor socioeconomic status. These are mainly due to vitamin-A deficiency, measles, trauma and harmful traditional eye medication. A study conducted in South Eastern Nigeria[23], in schools for the blind, found childhood factors to be the major etiology of blindness (37%). These comprised of measles in 64.8% trauma in 18.5% and harmful traditional eye medication in 16.7%. Childhood factors accounted also for the

majority of the cases in schools for the blind in Ethiopia (49.8%)[10], Bangeladesh (30.7%)[18], East Africa (29.9%)[17] and North Indian (28%)[19].

Hereditary factors constitute another important group of etiologies. Studies in some countries in Asia showed hereditary factors to account for the majority of cases of BL/SVI[20]. In SSA, hereditary factors rank the second position after childhood factors in most of the studies.[10]

Perinatal causes are uncommon in poor countries while they are one of the major causes of BL/SVI in developed and middle income countries[17]. Perinatal causes include retinopathy of prematurity (ROP) in middle income countries, cerebral hypoxia/injury and ophthalmia neonatorum in low income countries. ROP is an important cause of blindness in countries with intermediate infant mortality rates (IMRs between 10-60 per 1000 live births) where the survival of low birth weight infants has increased but technology for neonatal care is problematic[18]. The WHO estimates that 24% of the visually impaired infants in Latin America are attributed to ROP[22]. Studies in Argentina, Cuba and Paraguay showed that ROP was the primary cause of visual loss in 39%, 35% and 33% of children in schools for blind respectively[21]. In contrast, a lower frequency was observed in industrialized countries with IMRs of less than 10 per 1000 live births, where ROP accounts for between 6-20% of childhood blindness, probably the result of improvements in intensive neonatal care[31]. In very poor countries of SSA and Asia with IMR greater than 60 per 1000 live births, ROP is not considered a significant cause of childhood blindness due to the low survival rate of premature infants[17].

Intrauterine causes represent a minor group of causes of BL/SVI as shown in several studies. They comprise mainly of rubella infection, toxoplasmosis and maternal drugs/ alcohol[17].

2.2.3. Avoidable causes of blindness and severe visual impairment in children

The term avoidable encompasses preventable and treatable causes. Conditions amenable to primary prevention (i.e. where the condition causing blindness could have been entirely prevented) include measles infection, vitamin-A deficiency, and ophthalmia neonatorum, the use of harmful traditional eye medication remedies, congenital rubella syndrome, congenital toxoplasmosis, cerebral hypoxia and maternal drugs / alcohol. Conditions that could have been treated early to prevent blindness (i.e. secondary prevention) include glaucoma and ROP. Causes of blindness where sight can be restored (i.e. tertiary prevention) include cataract and selected cases of corneal scarring.

It is estimated that, in almost half of the children who are blind today, the underlying cause could have been prevented, or the eye condition treated to preserve vision or restore sight and a higher proportion of avoidable cause is found in low income countries[1].

Studies have shown high proportion of preventable and treatable cause of BL/SVI in Ethiopia (50.7% vs 17.3%)[10] , Sudan (45% vs 47.5%),[24] East Africa (21% vs 19%)[17],Bangladesh (27.8% vs 41.4%)[18] , South eastern Nigeria (47.3% vs 27.2%)[23] , Indonesia (33.3% vs 26.6%)20 , North India (28% vs 15.5%)[19] and South India (10.3% vs 19.2%)[17،10].

The available data suggest that worldwide, corneal scarring is the single most important cause of avoidable blindness, followed by cataract and ROP. Control of these conditions is given priority in WHO's VISION 2010 program, together with correction of significant refractive errors and provision of services for low vision[3]. In Ethiopia, a survey of three schools for the blind found blindness due to vitamin-A deficiency or measles to account for 87% of all preventable causes of childhood blindness[15]. In Bangladesh[18], vitamin-A deficiency and measles accounted for 34.4% of all avoidable causes of blindness. In the Philippines[25], congenital cataract remains the primary cause of preventable childhood blindness, with 60% attributed congenital rubella syndrome.

2.3 Magnitude of Visual Impairment in Mozambique

There is lack of reliable data and statistics about visual impairment. However, WHO estimated that 721,000 people were living with visual impairment. Of these people, 80% are victims of avoidable blindness[26]. The main causes of blindness in Mozambique are diseases resulting from lack of economic development, namely, cataract, trachoma, glaucoma, measles, mal nutrition, conjunctivitis, traditional medicine and injuries resulting from mines, work accidents, car accidents, and physical aggression[27].

Generally, visually impaired people suffer from unequal treatment within the family, an absence of inclusive education, poor access to, and awareness by, public and private institutions, an absence of appreciation of people's differences, lack of observance of the pre-established norms and policies, and weak consideration for the human rights of visually impaired people.

In Mozambique, for a population of around 720,000 visually impaired people, the current situation is summarized below:-

1. There is 1 special school for the education of visually impaired children
2. Less than 200 children and young people are studying either in these school, or other mainstream schools and higher education institutions
3. It is estimated that only 300 people have knowledge of Braille
4. The only place that offers formal rehabilitation for newly blind people has a maximum capacity of 6 people each year
5. Less than 60 people have paid employment, most of them working in government institutions as teachers, telephonists
6. Based on a sample survey carried out in 7 districts only 50% of visually impaired people know that HIV/AIDS exists and how they can protect themselves.
7. A visually impaired person with 4 or more children who has the right to assistance from the state will receive 5.6 USD per month.
8. There are 18 eye doctors (mostly foreigners) and 54 eye technicians to serve the whole country[27].

Despite recognizing the efforts of some people with visual impairment in entering the education system, education continues to be characterized by the absence of a clear policy on special education and inclusive schools, by the lack of assistive equipment in schools, the lack of a comprehensive teacher training curriculum in Braille and visual impairment, by the lack of incentives to teachers to guarantee the complete supervision of blind students and the lack of involvement of families in accompanying the education of their visually impaired children. As a consequence, only around 300 people can read Braille in the country, 150 are currently in the formal education system, 10 attend higher education and only 10 women have received education at primary and secondary level, a situation in flagrant contradiction of the recommendations in the Sustainable Development Goals/Global Goals (SDGs) objectives[28].

2.4: Statement of the Problem

Mozambique is a country with a very low socioeconomic status, and children below the age of 15 make up almost 45% of its 24 million population[29]. The under 5 years mortality rate is 87/1000 live births, which is unacceptably high even by Sub-Saharan standards[30]. The immunization coverage for measles (age 12-23mths) is 85%. The national Expanded Programme of Immunization (EPI) for improving immunization coverage among children against vaccine preventable diseases has made substantial progress in recent years. The proportion of one-year-old children fully immunized against the six main vaccine preventable diseases (diphtheria, pertussis, tetanus, polio, measles and TB) increased from 47 per cent in 1997 to 63 per cent in 2003. However, coverage remains low and highly unequal. The 2003 Demographic and Health Survey (DHS)[36] indicated that full immunization coverage among one-year-old children was 81 per cent in urban areas compared to only 56 per cent in rural areas. Coverage among children of mothers with no education was 49 per cent compared to 98 per cent among children of mothers with secondary education.

In 2002, the National Survey on vitamin A deficiency and anemia indicated that 69 per cent of children 6-59 months were suffering from vitamin A deficiency, 14 per cent in a severe form. Vitamin A improves children's resistance to infection such as diarrhea diseases, Acute Respiratory Infections (ARI), measles and malaria. Severe vitamin A deficiency can also lead to poor eyesight and blindness.

The gross enrollment rate at primary school is 105% and the rate of primary completion for education is 49%[29].

The need to expand and improve the quality of eye care services in Mozambique is self-evident[1]. In Mozambique, just 18 ophthalmologists and 54 ophthalmic nurses serve a population of 24 million and thus, theoretically one ophthalmologist is responsible for 1.3 million patients.[31] There is no paediatric ophthalmologist and no paediatric eye clinics.

The Rapid Assessment of Avoidable Blindness (RAAB) study[37], conducted in December 2012 in Sofala Province with support of Light for The World showed that the prevalence of blindness among those who are 50 years of age and older was 3.2% and that of visual impairment in the better eye was 17.5%. Cataract was the major cause of blindness (54.2%) and visual impairment (48%). Avoidable causes of blindness were responsible for 73% of bilateral blindness and 90% of visual impairment. The cataract surgical coverage was only

33.1% and the result of cataract surgery were also a major concern because 31.8% of eyes that had undergone cataract surgery had VA <6/60 with best correction. But, there are no accurate data indicating the burden of blindness in children in Beira region as no epidemiological surveys have ever been done[32]

CHAPTER THREE: STUDY RATIONALE

Research has shown that interventions to improve eye health in developing countries are among the most cost effective public health programs available, and return $4 for every $1 invested[3]. Reducing blindness and vision impairment also has a crucial role to play in reducing poverty and can have a huge impact on communities and on the overall effort to achieve the Sustainable Development Goals/Global Goals (SDGs). Although the actual number of blind children is much smaller than the number of adults who are blind, the number of "blind years" resulting from blindness in children is almost equal to the number of blind years due to age related cataract[2]. Furthermore, many of the causes of blindness in children are either preventable or treatable, and are also related to child mortality. Therefore, the control of blindness in children is considered a high priority within the World Health Organization's Vision 2020 initiative: the right to sight. To achieve the objective of this initiative, each country has to determine the major causes of childhood blindness. There is lack of this data in Mozambique, yet no study has been done to establish this problem. Examination of students enrolled in schools for the blind will be a good source of data on the pattern of childhood blindness, as reliable population-based studies on the causes of SVI/BL in children are difficulty to conduct. Therefore, findings of this study will form a baseline on childhood blindness in Mozambique and will be useful in planning appropriate interventions for prevention of avoidable causes and management of SVI/BL in children.

CHAPTER FOUR: OBJECTIVES

4.1: Broad Objective

To determine the causes of blindness and severe visual impairment (BL/SVI) among students attending schools for the blind in Beira, Mozambique.

4.2: Specific Objectives

1. To determine the anatomical and etiological cause of BL/SVI.
2. To determine possible avoidable causes of BL/SVI.

CHAPTER FIVE: MATERIALS AND METHODS

5.1 Study Design

Descriptive cross-sectional study.

5.2 Study Setting

Figure 1: Map of Republic of Mozambique

This study was carried out at the school for the blind in Beira-Mozambique. The "Instituto dos Deficientes visuais da Beira", is the only school for the education of visually impaired children in Mozambique. Beira is the second largest city in Mozambique. Lies in the central region of the country in Sofala Province, where the Pungue River meets the Indian Ocean. From a population of 412,588 in 1997, Beira grew to an estimated 546,000 in 2006. The regionally significant Port of Beira is a gateway for both the central interior portion of the country as well as the land-locked nations of Zimbabwe, Zambia and Malawi. Beira was originally developed by the Portuguese Mozambique Company in the 19th century, and directly developed by the Portuguese colonial government from 1947 until Mozambique gained its independence from Portugal in 1975[33].

5.3 Study Population

The study targeted students attending the school for the blind in Beira-Mozambique. This is the only school for the BL/ SVI in Mozambique. Presently, the day school has a total of 126 students, made up of 7 classes from class 1 to class 7, mixed boys and girls. The school is closed for holiday during the month of July and December every year.

5.4 Inclusion and Exclusion Criteria

5.4.1 Inclusion Criteria

All students attending the school for the blind in Beira, who became visually impaired before the age of 16 years,

5.4.2 Exclusion criteria

Students who became visually impaired at the age of 16 years and above.

5.5: Study Period

The study took a total duration of 6 months.

5.6: Sampling Procedure

All Students attending the school for the blind in Beira who meet the inclusion criteria and who were present during the study period participated in the study.

5.7: Material

1. Modified WHO/PBL eye examination record for children with blindness and low vision form (see appendix II).
2. Screening for BL/ SVI utilized several instruments:
3. Tumbling E chart
4. Colour vision chart
5. Torch and batteries
6. Retinoscopy

7. Refraction set and trial frame
8. Direct ophthalmoscope
9. Indirect ophthalmoscope
10. Handheld Slit lamp
11. 20 Dioptre lens
12. 90 Dioptre lens
13. Tropicamide (0.8%) with phenylephrine (5%) eye drops

5.8: Data Collection Procedure

The school for the blind in Beira was selected for this study. All students attending the school for the blind in Beira who meet the inclusion criteria and who were present during the study period were examined. Data collection was conducted in September 2015.

Informed consent was obtained from each student and Parent/Guardian at the time of interview/examination (appendix V: Consent/Assent form)

Information was gathered using interview with students and school staff. All students were interviewed and examined but only those who became visually impaired before the age of 16 years were included in the analysis. The standard WHO/PBL eye examination record for children with blindness and low vision protocol was used to record the visual acuity, anatomical site of abnormality leading to visual loss, and underlying etiology (appendix II) according to the coding instructions.

During the study, we recruited consecutive students, and examine them in a particular identified room in school with appropriate condition as dark room.

The investigator did all the procedures. History of the age at onset of visual loss, family history, history of consanguinity and information about hereditary diseases, intrauterine, perinatal or childhood factors and previous eye surgery was taken. A Tumbling E chart was used to measure visual acuity levels of 6/18, 6/60, and 3/60 with available correction (if any).

If a child was not be able to see the 3/60 optotype, he/she was checked for Hand Movement and perception of light. The distance visual acuity was measured separately for each eye and then with both eyes together. Anterior segment examination was performed using a Handheld slit lamp. Posterior segment evaluation was done after dilating the pupil, where indicated, using a direct and/or indirect ophthalmoscope. Refraction --- OR or SR was only performed in cases where visual improvement is to be expected from the clinical findings. Low vision assessment, intraocular pressure, and visual field measurements was not undertaken due to complexity of procedure in children.

Any required therapeutic interventions were recorded and all students who needed treatment were referred to the appropriate clinician for management.

Data was analyzed using software that accompanies the form. The anatomical site of abnormality and underlying etiology was recorded for each eye, and one selected as the main site and cause for the child. To determine the major anatomical site of abnormality leading to visual loss for each eye when two or more sites of abnormality were present in the same eye, we used the criteria given in the WHO/PBL examination record for children with blindness and low vision coding instructions. The same manual was used to determine the anatomical site of abnormality leading to visual loss for the child and the etiology of visual loss.

The definitions of BL/SVI used in this study follow the International Statistical Classification of Diseases and Related Health Problems, 10th Revision (ICD-10):H54 (Appendix III).

Figure 2: School for the blind in Beirra, students waiting for interview and examination during data collection.

5.9: Data Analysis

The data entering forms were reviewed and missing or inappropriate entry identified and amended appropriately. The data were then entered into Microsoft excel cleaned and transferred to Statistical Program for Social Sciences (SPSS) version 20. Categorical variables were analyzed using frequencies and percentage.

5.10: Ethical Considerations

To adhere to ethical codes, permission and authority to conduct the study was sought from the Ethics and Research Committee of University of Nairobi/Kenyatta National Hospital. In Mozambique, ethical approval to conduct the study was sought from the National Ethics Committee of Bioethics of Health (Appendix VI). A translated in Portuguese informed consent was also obtained from the Parent/Guardian. The investigator readied all the information from consent/assent form for each students and Parent/Guardian. The Parent/Guardian were informed that the students were free to withdraw from the study if they feel to do so at any time. Anonymity of research subjects and confidentiality was highly maintained. All students who need treatment were referred to the appropriate clinician for management. The instillation of eye drops to dilate the pupil for ocular fundus examination can cause transit blurred of vision, all the student and they Parent/Guardian were informed to take extra care.

The student and Parent/Guardian signed or putted the finger prints on consent for and return one copy to the investigator and one copy remain with student and Parent/Guardian.

CHAPTER SIX: RESULTS

The study was conducted at Beira school for the blind in Mozambique in September, 2015. Out of the 113 registered students, the researcher obtained complete data from 99 Students who were present at time of study. In this chapter we present the findings of the study in form of charts, tables, frequencies and percentages to summarize the data obtained.

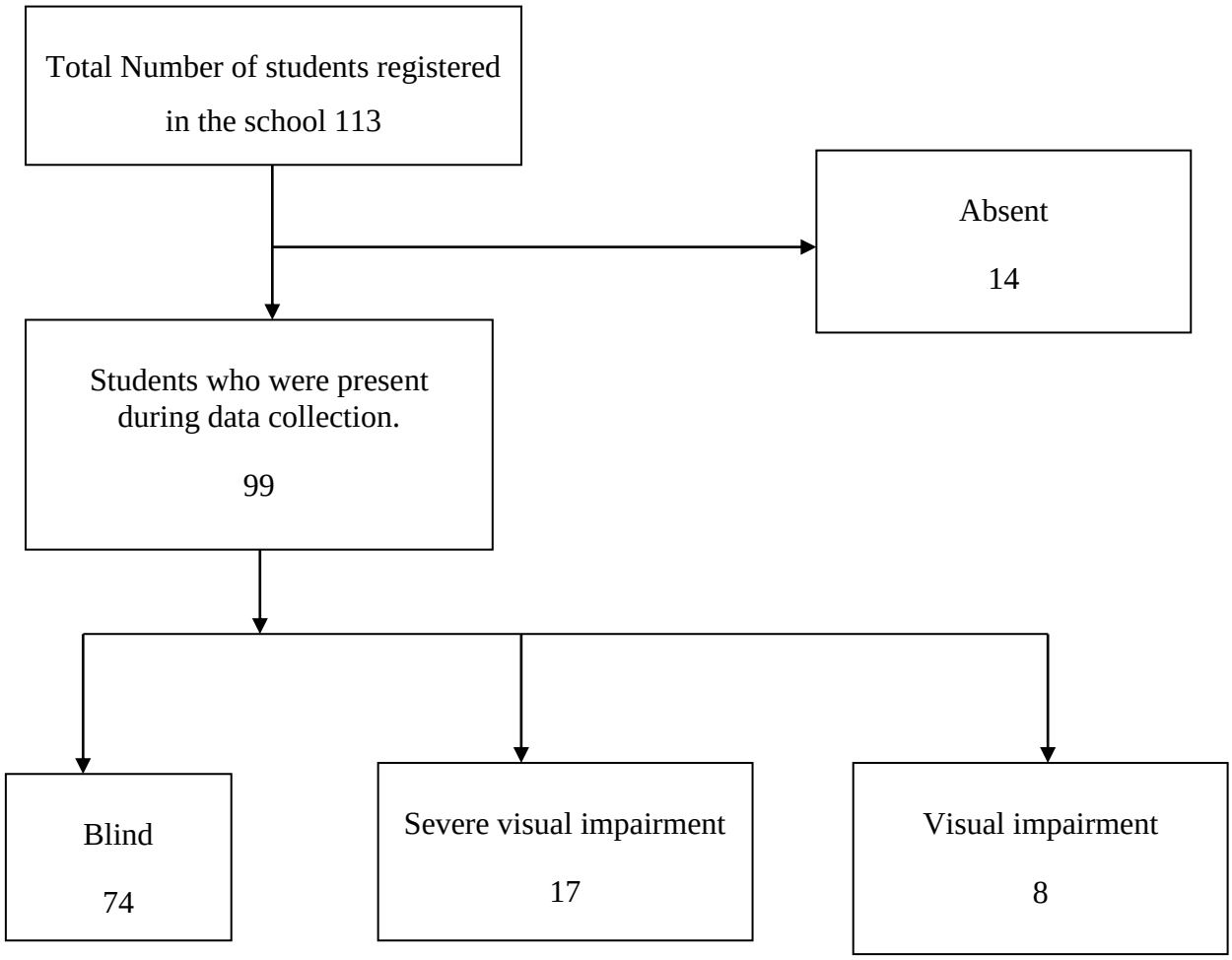

Figure 3: Flow chat of students who were present during data collection and their visual status with presenting vision.

The 8 (8.1%) students who were visual impaired on presenting vision are not included in further analysis for the causes of BL/SVI.

6.1 Demographic characteristics of all study participants

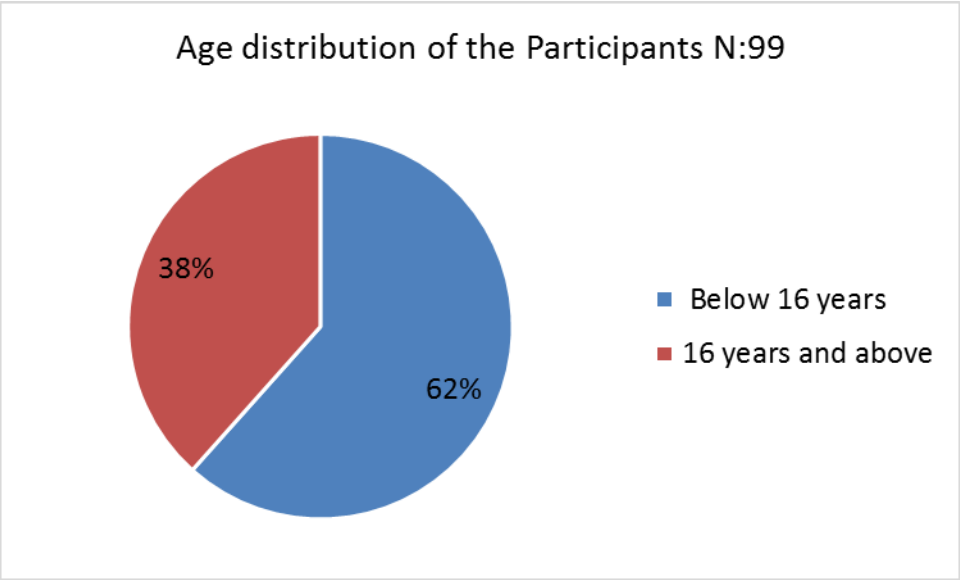

Figure 4: Age distribution of the participants

The range in age was 6 years to 32 years, with a mean age of 13 years.

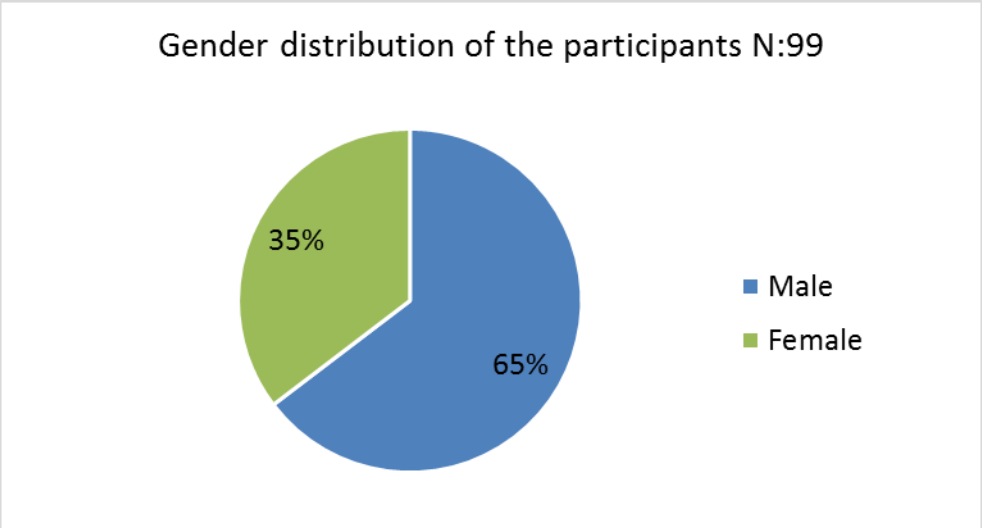

Figure 5: Gender distribution of the participants

The male (64) to female (35) ratio was 1.8:1 among the students, i.e. all registered students.

Table 1: Age of onset of visual impairment (n=99)

Age of onset	No of Students	Percent
At birth	20	20.2
0-1year	15	15.2
1-15years	63	63.6
Not recorded in file	1	1.0
Total	**99**	**100.0**

6.2 Visual Status of the participants

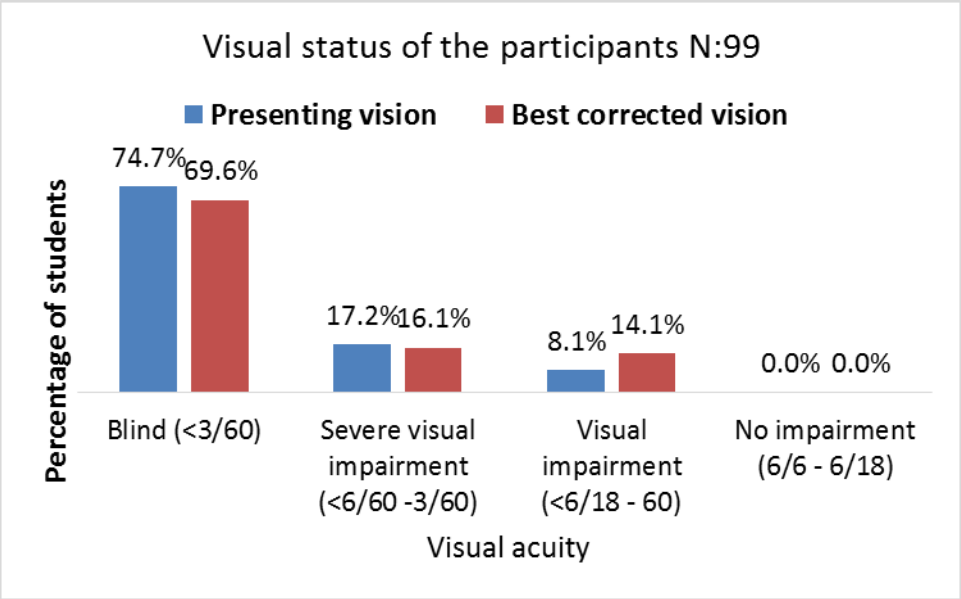

Figure 6: Presenting visual acuity and best corrected visual acuity of the Participants

In this school there was no student without visual impairment.

A total of 74 (74.7%) were blind on presenting vision, 17(17.2%) were severe visual impaired, 8 (8.1%) were visual impaired.

6.3 Anatomical causes of BL/SVI

Table 2: Anatomical Causes of BL/SVI of the students (n=91)

Site of Abnormality	N^0 Students	Percentage
Whole globe pathology	36	39.6
Cornea	31	34.1
Optic nerve atrophy	13	14.3
*Lens	6	6.6
**Globe appears normal	2	2.2
Uvea(coloboma-1,uveitis-1)	2	2.2
Retina dystrophy(R.Pigmentosa)	1	1.1
Total	**91**	**100**

Whole globe and cornea pathology were the most common causes of BL/SVI

*Lens: Cataract (4), Aphakia (2)

**Globe appears normal: Cortical blindness (1), nystagmus (1)

6.3.1 Whole globe

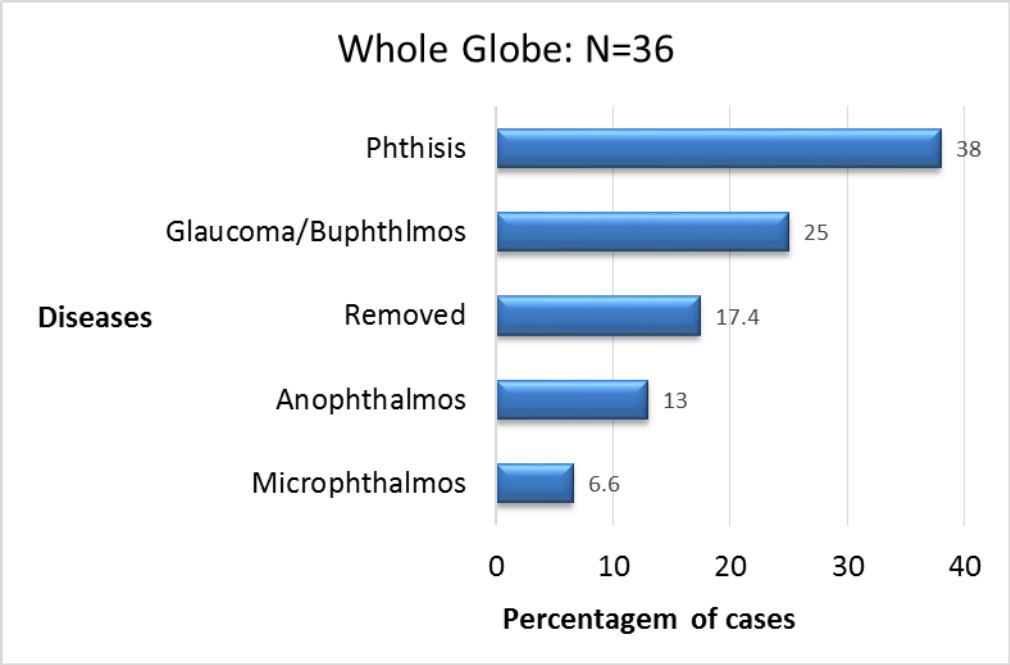

Figure 7: Causes of BL /SVI involving the whole globe

6.3.2 Cornea

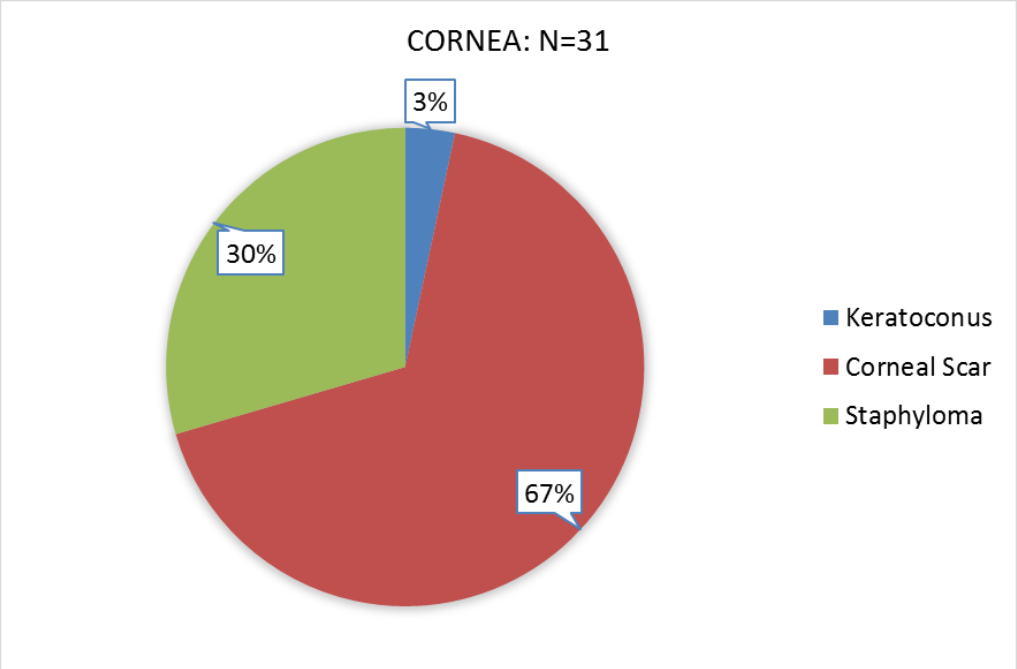

Figure 8: Abnormalities found in the Cornea leading to BL/SVI

6.4 Etiological factors

Table 3: Etiological causes of visual BL/SVI in students (N= 91)

Etiology	**N^0 Students**	**Percentage**
Nonspecific	42	46.1
Postnatal	30	33.0
*Perinatal	10	10.9
**Intrauterine	9	10.0
Total	**91**	**100**

*Perinatal causes were Cerebral hypoxia (5), Ophthalmia neonatarum (4), R.O.P (1).

**Intrauterine: Toxoplasmosis (5), Rubella (4).

6.4.1Nonspecific etiology

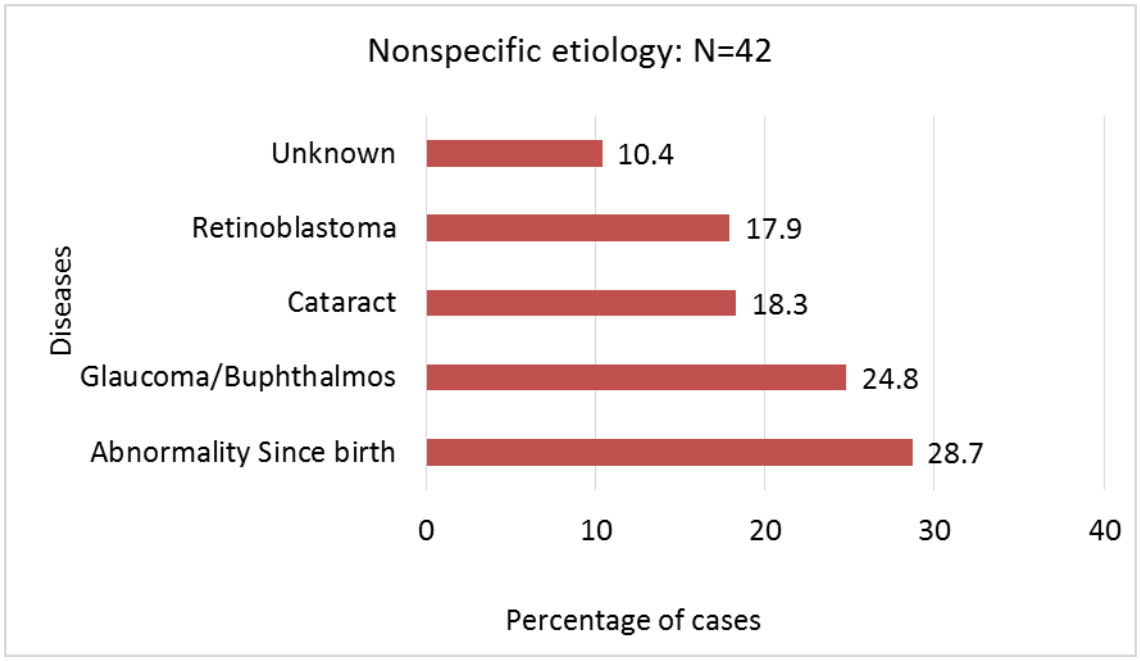

Figure 9: Nonspecific etiologies of BL/SVI

Unknown factors refers to those where etiology could not be established

Abnormality since birth include developmental abnormalities such as microphthalmos, where there is no family history or known exposure to intrauterine factors.

6.4.2Postnatal factors

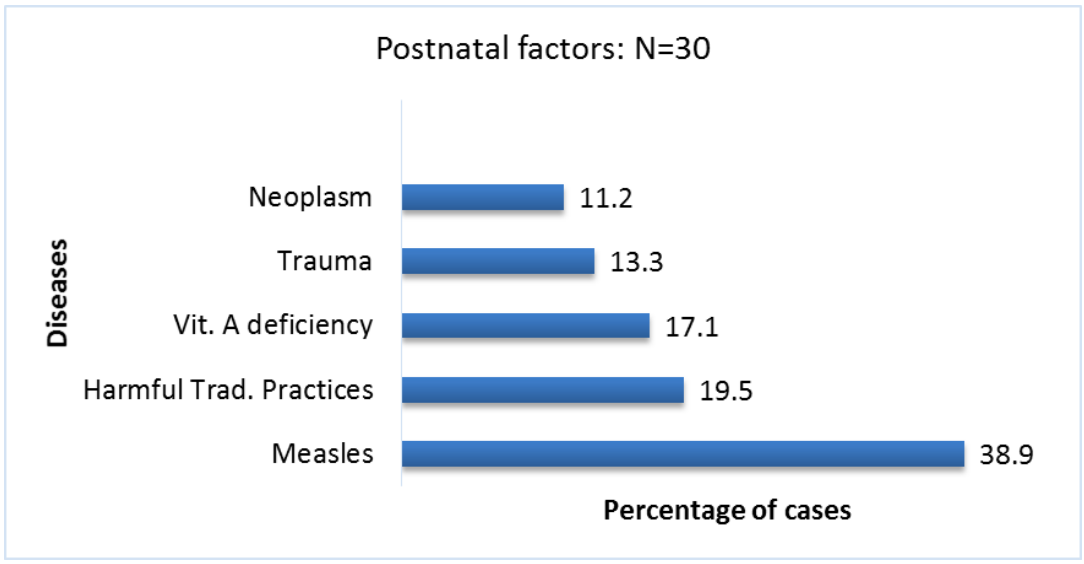

Figure 10: Postnatal etiologies of BL/SVI

6.5 Possible avoidable causes of BL/SVI

Table 4: Proportion of avoidable causes of BL/SVI in school for the blind in Beira-Mozambique, September 2015

Causes of SVI/BL	**N^0 Students**	Percentage
Avoidable	65	71.4
Non avoidable	26	28.6
Total	**91**	**100**

Overall, 69.7% pupil had potentially avoidable causes of BL/SVI.

Table 5: Causes of avoidable BL/SVI in school for the blind in Beira-Mozambique, September 2015

Pathologies		**N^0 Students**	**Percentage**
	Vit-A deficiency/Measles	16	17.6
	Harmful Traditional Eye Practices	8	8.8
	Trauma	5	5.5
	Toxoplasmose	5	5.5
	Cerebral visual impairment	5	5.5
	Ophthalmia neonatorum	4	4.3
	Microphthalmos/Rubella	4	4.3
	Retinopaty of Prematurity	1	1.0.
Preventable causes	**Total**	**48**	**52.7**
	Glaucoma/Buphthalmos	9	9.9
	Cataract	6	6.5
	Uveitis	1	1.0
	Keratoconus	1	1.0
Potentially treatable causes	**Total**	**17**	**18.7**
Non avoidable		26	28.6
Total		**91**	**100**

Vitamin A deficiency and measles were the most common preventable cause of blindness and severe visual impairment, while glaucoma was the most common potentially treatable cause followed by cataract. A significant proportion of students suffered unavoidable causes.

CHAPTER SEVEN: DISCUSSION

7.1 Demographic characteristics of students.

The study established that most (64.7%)of the students were males (Figure 4), with a male to female ratio of 1.8:1 that was slightly higher than in general primary schools(1:0.9), and in the general national population (0.95:1.1) in Mozambique[34.]In Burundi, Ruhagaze et al found an approximately equal number of male and female in the ratio of 1.2:1[11].Our findings may be confirming a report that most of the families in Mozambique especially in rural communities believe that investing in the education of girls has no income prospects[38].

A significant proportion of the students in this study were older than 15 years (38%), mostly from rural areas, and were enrolled because they were aware of the existence of special education for the blind. Comparatively in the same region, normal sighted children enrolled in primary schools at a much younger age.

Most (63.6%) of the students had the onset of visual loss between the age of 1-15 years (Fig4).This is similar to what Omolase *et al* in Nigeria found where most of students had onset of visual loss in childhood[41].When we correlated the age of onset of visual loss with the causes of visual impairment, this suggests weakness in prevention and management of childhood eye diseases leading to blindness (Table 5).

7.2 Categories of visual loss

A large proportion of the students were blind (74.7%), similar to the findings of Ruhagaze et al in Burundi (86%) of students were blind[11], and in Malawi where Kalua *et al*. (75%) [14]**.** However, Kello *et al*. in Ethiopia found a higher proportion (94%) of the study population were blind or visually impaired.[10]

Of concern, some students had improvement of their presenting vision after refraction (Figure 6). Ideally, these students should have been enrolled in normal school if their visual acuity had been corrected with eyeglasses first before enrollment.

7.3 Anatomical causes of BL/SVI

The most common anatomical site of BL/SVI was phthisis and cornea scar (Figure 7 & 8). Similarly in Ethiopia, Kello and Gilbert[10] found cornea/phthisis were the major anatomical site of visual loss. In developing countries, similar findings were reported byRuhagaze[11]in Burundi,Rahi[39]India,and Njuguna et al in Malawi[17].Based on etiological causes, a high proportion of phthisis/cornea pathology was due to measles, vitamin A deficiency and harmful traditional eye treatment. This may be explained by the fact that majority of the students came from rural areas with poor coverage of measles vaccination and vitamin A supplementation during the post-civilian war period (1994 – 2005) that resulted in high rates of malnutrition[40] (Appendix IV). We suspect late presentation, few trained health workers, lack of eye care services, lack of equipment and non-existence of visual rehabilitation centers in most parts of Mozambique may have contributed to the findings.

Notably, four students in our study were found to have un-operated cataracts and had never been reviewed by any eye health worker. These students were referred to an ophthalmologist during our study, which illustrates a gap in the Beira School enrollment system and a need for scheduled follow up revisits by a skilled eye health worker.

7.4 Etiological factors

Comparable to countries with poor socioeconomic status, we found that childhood etiological factors (33%) accounted for most of the cases (table 3), similar to findings reported in Ethiopia (49.8%)[15], Bangeladesh (30.7%)[18], East Africa (29.9%)[17] and Northern India (28%)[19].

We found childhood factors causing BL/SVI were as a result of Measles, harmful traditional practices and Vitamin A deficiency. The high rate of blindness related to measles in our study is likely due to low vaccination coverage before 2005 (Appendix IV).Commonly, the traditional treatment is the first alternative that most of Mozambicans access for their health problems including the eye diseases.

7.5 Possible avoidable causes of BL/SVI.

The majority of students had potentially avoidable causes of BL/SVI (71.4%), of which the most preventable cause was measles (38.9%) while glaucoma (24%) and cataract (18.2%) were the most treatable cause (Table 4, 5).Other African and Asian countries showed similar high proportion of avoidable causes of BL/SVI; 74.5% in South Eastern Nigeria,[41] 68% in Ethiopia,[15] and 58% in Indonesia [35].

For the preventable causes of BL/SVI, our findings suggest the need of primary prevention through strategies such as breast feeding, health nutrition education, continuous vitamin A supplementation, and measles immunization. In order to address the treatable causes, there is need to develop comprehensive specialized pediatric eye services in Mozambique.

7.6: Limitations

1. In some cases medical records were not available and informant could not be traced.
2. Information was gathered using interviews with students and school staff, who may not have been able to give clear information about the circumstances and timing of onset of blindness.
3. A school-based study is not representative of the whole country because the pre-school students were missed, and not all blind students can be admitted in the school due to limited numbers per class and there is only one school for the whole country.

CHAPTER EIGHT: CONCLUSION

1. The most common causes of blindness and severe visual impairment (BL/SVI) among students attending school for the blind in Beira, Mozambique were whole globe pathologies and corneal scars based on the anatomical site

2. The postnatal factors were the main etiological cause

3. Most of the causes of BL/SVI were potentially avoidable, with measles as the most common preventable, while glaucoma and cataract were the most common treatable cause.

CHAPTER NINE: RECOMMENDATIONS

1. Policy makers should enact public health policies aimed at addressing possibly avoidable causes of BL/SVI using strategies such as programs for measles immunization and vitamin A supplementation.

2. There is need to train skilled health workers on early detection, referral and management of children with eye disease.

3. Policy should include mandatory eye examination by ophthalmologist before admission to schools for the blind.

4. Future longitudinal and ethnographic studies should address causes of BL/SVI with special emphasis on the potentially avoidable causes.

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CHAPTER ELEVEN: APPENDICES

Appendix I: Budget

RESEARCH BUDGET

TITLE: **CAUSES OF BLINDNESS AND SEVERE VISUAL IMPAIRMENT AMONG STUDENTS ATTENDING SCHOOL FOR THE BLIND IN BEIRA, MOZAMBIQUE**

Setting: Schools for the blind in Beira, Mozambique

PRINCIPAL INVESTIGATOR: Dr. Argentino Albino ALMEIDA

ITEM	**Quantity**	**Unit Cost (KSh)**	**Frequency**	**Total cost (KSh)**
Proposal typing and copying				
Printing of proposal - 1st and 2nd drafts	41	10	2	820
Photocopy of proposal - 1st and 2nd drafts	41	3	4	492
Binding Proposal	3	100	1	300
Ethics submission fee, Kenya	1	2000	1	2000
Statistician	1	25000	1	25000
Sub-total				**28,612**
Communication and Transportation:				
Nairobi-Mozambique-Nairobi	1	95,000	1	95,000
Accommodation for 18 nights (field visit)	1	1600	28	44,800
Lunch& Dinner	1	1000	18	18,000
Email and telephone	1	5000	1	5,000
Sub-total				**162,800**
Results				
Printing of data collection tool – questionnaire	4	10	1	40

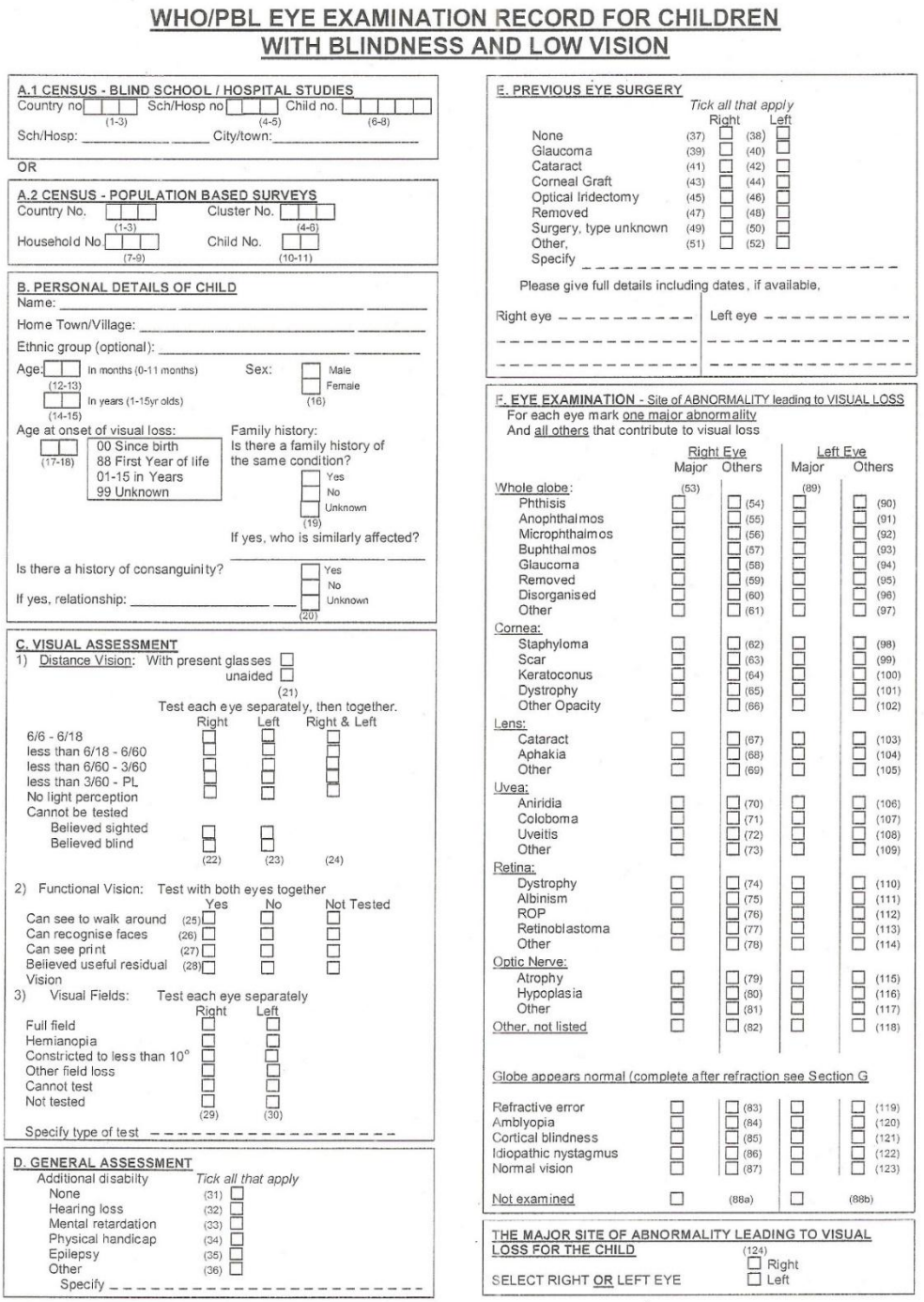
Photocopy of data collection tool – 126 questionnaires x 4 pages	600	3	1	1800
Printing of results (black and white)	70	10	3	2100
Printing of results (colored)	15	30	3	1350
Copy final book (black and white)	70	3	8	1680
Copy final book (colored)	15	20	8	2400
Binding of report	1	200	8	1600
Sub-total				**10,970**
TOTAL BUDGET				**202,382**

Approved by Dr. Margaret Njuguna; MBChB, MMedOphth,FPO&S, FEACO

Lecturer, Department of Ophthalmology/ UON

Signature…….date……

Appendix II: Modified WHO/PBL Eye Examination Record for Children with Blindness and Low Visin Form



WHO/PBL EYE EXAMINATION RECORD FOR CHILDREN WITH BLINDNESS AND LOW VISION

A.1 CENSUS - BLIND SCHOOL / HOSPITAL STUDIES
Country no (1-3) Sch/Hosp no (4-5) Child no. (6-8)
Sch/Hosp: _____ City/town: _____

OR

A.2 CENSUS - POPULATION BASED SURVEYS
Country No. (1-3) Cluster No. (4-6)
Household No. (7-9) Child No. (10-11)

B. PERSONAL DETAILS OF CHILD
Name: _____
Home Town/Village: _____
Ethnic group (optional): _____
Age: (12-13) In months (0-11 months) (14-15) In years (1-15yr olds)
Sex: Male Female (16)
Age at onset of visual loss: (17-18)
00 Since birth
88 First Year of life
01-15 in Years
99 Unknown
Family history:
Is there a family history of the same condition? Yes No Unknown (19)
If yes, who is similarly affected? _____
Is there a history of consanguinity? Yes No Unknown
If yes, relationship: _____ (20)

C. VISUAL ASSESSMENT
1) Distance Vision: With present glasses unaided (21)
Test each eye separately, then together.

	Right	Left	Right & Left
6/6 - 6/18			
less than 6/18 - 6/60			
less than 6/60 - 3/60			
less than 3/60 - PL			
No light perception			
Cannot be tested			
Believed sighted			
Believed blind			
	(22)	(23)	(24)

2) Functional Vision: Test with both eyes together

	Yes	No	Not Tested
Can see to walk around (25)			
Can recognise faces (26)			
Can see print (27)			
Believed useful residual Vision (28)			

3) Visual Fields: Test each eye separately

	Right	Left
Full field		
Hemianopia		
Constricted to less than 10°		
Other field loss		
Cannot test		
Not tested		
	(29)	(30)

Specify type of test _____

D. GENERAL ASSESSMENT
Additional disability — Tick all that apply

None	(31)
Hearing loss	(32)
Mental retardation	(33)
Physical handicap	(34)
Epilepsy	(35)
Other	(36)

Specify _____

E. PREVIOUS EYE SURGERY
Tick all that apply

	Right	Left
None	(37)	(38)
Glaucoma	(39)	(40)
Cataract	(41)	(42)
Corneal Graft	(43)	(44)
Optical Iridectomy	(45)	(46)
Removed	(47)	(48)
Surgery, type unknown	(49)	(50)
Other, Specify _____	(51)	(52)

Please give full details including dates, if available,
Right eye _____ Left eye _____

F. EYE EXAMINATION - Site of ABNORMALITY leading to VISUAL LOSS
For each eye mark one major abnormality
And all others that contribute to visual loss

	Right Eye Major	Right Eye Others	Left Eye Major	Left Eye Others
Whole globe:	(53)		(89)	
Phthisis		(54)		(90)
Anophthalmos		(55)		(91)
Microphthalmos		(56)		(92)
Buphthalmos		(57)		(93)
Glaucoma		(58)		(94)
Removed		(59)		(95)
Disorganised		(60)		(96)
Other		(61)		(97)
Cornea:				
Staphyloma		(62)		(98)
Scar		(63)		(99)
Keratoconus		(64)		(100)
Dystrophy		(65)		(101)
Other Opacity		(66)		(102)
Lens:				
Cataract		(67)		(103)
Aphakia		(68)		(104)
Other		(69)		(105)
Uvea:				
Aniridia		(70)		(106)
Coloboma		(71)		(107)
Uveitis		(72)		(108)
Other		(73)		(109)
Retina:				
Dystrophy		(74)		(110)
Albinism		(75)		(111)
ROP		(76)		(112)
Retinoblastoma		(77)		(113)
Other		(78)		(114)
Optic Nerve:				
Atrophy		(79)		(115)
Hypoplasia		(80)		(116)
Other		(81)		(117)
Other, not listed		(82)		(118)

Globe appears normal (complete after refraction see Section G

Refractive error		(83)		(119)
Amblyopia		(84)		(120)
Cortical blindness		(85)		(121)
Idiopathic nystagmus		(86)		(122)
Normal vision		(87)		(123)
Not examined		(88a)		(88b)

THE MAJOR SITE OF ABNORMALITY LEADING TO VISUAL LOSS FOR THE CHILD (124)
SELECT RIGHT OR LEFT EYE Right Left

G. REFRACTION/LOW VISION AID ASSESSMENT

	Yes	No	Not indicated	Not done
Vision improves with a pinhole	☐ (125)	☐	☐	☐
Refraction performed now	☐ (126)	☐		
Vision assessed with low vision aid	☐ (127)	☐	☐	

1) If refraction performed, visual acuity with corrective lenses

Distance: Test each eye separately, then together

	Right	Left	Right & Left
6/5 - 6/18	☐	☐	☐
Less than 6/18 - 6/60	☐	☐	☐
Less than 6/60 - 3/60	☐	☐	☐
Less than 3/60	☐	☐	☐
	(128)	(129)	(130)

Specify corrective lenses and visual acuity

Right eye _____ VA _____

Left eye _____ VA _____

Near: Test with both eyes together

Can discern print/ symbols equal to or smaller than 5mm (≤5mm) Yes (131)☐ No ☐

☐ ○ △ Example of 5mm symbols

2) If assessed with low vision aid (LVA), visual acuity with LVA:

Distance:

Specify type of LVA and visual acuity

Right eye _____ VA _____

Left eye _____ VA _____

Near:

Specity type of LVA and near acuity

Right eye _____ VA _____

Left eye _____ VA _____

	Right	Left
Can discern print ≤5mm	☐	☐
Can discern print >5mm	☐	☐
Cannot discern print	☐	☐
	(132)	(133)

H. EYE EXAMINATION - AETIOLOGY OF VISUAL LOSS

Select one of the categories 1-5 for each eye

Tick all that apply within the selected category.

		Right eye Definite	Right eye Suspect	Left eye Definite	Left eye Suspect
1) Hereditary Disease:	Chromosomal	(134)☐	☐	(135)☐	☐
	Mitochondrial	(136)☐	☐	(137)☐	☐
	Autosomal dominant	(138)☐	☐	(139)☐	☐
	Autosomal recessive	(140)☐	☐	(141)☐	☐
	X-linked	(142)☐	☐	(143)☐	☐
	Cannot Specify	(144) ☐		(145) ☐	
2) Intrauterine factor:	Rubella	(146)☐	☐	(147)☐	☐
	Toxoplasmosis	(148)☐	☐	(149)☐	☐
	Drugs/alcohol	(150)☐	☐	(151)☐	☐
	Other, Specify _____	(152)☐	☐	(153)☐	☐
3) Perinatal/ Neonatal factor:	Cerebral hypoxia/injury	(154)☐	☐	(155)☐	☐
	R.O.P	(156)☐	☐	(157)☐	☐
	Ophthalmia neonatorum	(158)☐	☐	(159)☐	☐
	Other, Specify _____	(160)☐	☐	(161)☐	☐
4) Postnatal/ Infancy/ Childhood factor:	Vitamin A deficiency	(162)☐	☐	(163)☐	☐
	Measles	(164)☐	☐	(165)☐	☐
	Neoplasm	(166)☐	☐	(167)☐	☐
	Trauma	(168)☐	☐	(169)☐	☐
	Harmful Trad. Practices	(170)☐	☐	(171)☐	☐
	Other, Specify _____	(172)☐	☐	(173)☐	☐
5) Cannot determine (unknown aetiology)	Cataract	(174)☐		(175)☐	
	Glaucoma/Buphthalmos	(176)☐		(177)☐	
	Retinoblastoma, no FH	(178)☐		(179)☐	
	Abnormality since birth	(180)☐		(181)☐	
	Specify _____				
	Other,	(182)☐		(183)☐	
	Specify _____				

THE MAIN AETIOLOGY OF VISUAL LOSS FOR THE CHILD

SELECT ONE FROM POSTIONS 134-183 [_ _ _ _] (184)

I. ACTION NEEDED

1) Optical — *Tick all that apply*

- None (185) ☐
- Refraction later (186) ☐
- Spectacles (187) ☐
- Low Vision Aid (188) ☐

2) Medical/ Surgical — *Tick all that apply*

- None (189) ☐
- Medication (190) ☐
- Surgery (191) ☐
- Specify _____
- Other (192) ☐
- Specify _____

J. PROGNOSIS FOR VISION

Tick one box only for each eye

	Right eye	Left eye
Could be improved	☐	☐
Likely to remain stable	☐	☐
Likely to deteriorate	☐	☐
	(193)	(194)

K. EDUCATION

1) Present Schooling — Tick one box only

- Special school for the blind ☐
- Special school for the multiple handicapped ☐
- Integrated education ☐
- None ☐
- Other ☐
- Specify (195) _____

2) Recommendations

Change in schooling recommended (196) Yes ☐ No ☐

Specify _____

L. FULL DIAGNOSIS

Specify full anatomical and aetiological diagnosis:

Right eye:

_____

_____

_____

Left eye:

_____

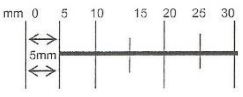
_____

M. EXAMINER:

Examined by

_____

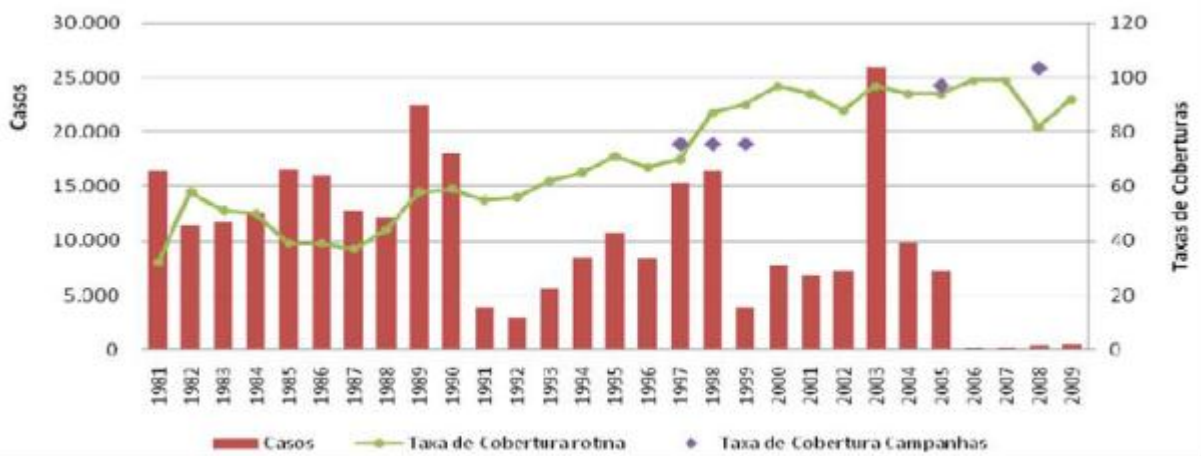
Date (month) (year) (197-200)



Appendix III: Category of Blindness and Low Vision (Visual Impairment)

Category of VI		Visual acuity with best possible correction	
		Maximum less than:	Minimum equal to or better than
Low vision	1	6/18	6/60
	2	6/60	3/60
Blindness	3	3/60	1/60
	4	1/60	Light perception (LP)
	5	No light perception (NLP)	
	9	Undetermined or unspecified	

Appendix IV: Number of cases and vaccination coverage of measles vaccine in Mozambique, 1981 -2009 (Fonte MISAU)



Appendix V: Consent Form

Consent information

I, Dr Argentino of the Department of Ophthalmology, University of Nairobi, am conducting a study to establish the causes of blindness and visual impairment among students attending school for the blind in Beira, Mozambique. The information obtained from the study will give the baseline on childhood blindness in Beira and the whole of Mozambique. It will also be useful in planning appropriate interventions for prevention of avoidable causes and management of BL/SVI among students.

A history of the age at onset of visual loss, family history, history of consanguinity, and information about hereditary diseases, intrauterine, Perinatal or childhood factors and previous eye surgery will be taken. All the students will be examined by the principal investigator (Dr. Argentino) and a qualified ophthalmologist. Uniocular and binocular visual acuity (VA) will be measured for each student. Objective and subjective refraction will be done for all students with VA less than 6/18. General assessment will be carried to identify additional disabilities. Anterior segment examination will be done with torchlight and a simple magnifying loupe or portable slit lamp, if possible dilating drops

(Tropicamide/Mydriacyl) and cycloplegic drops (Cyclopentolate) will be used to examine the posterior segment of the eye except where inappropriate. Dilating drops may cause mild irritation, transient blurring of vision and glare lasting up to four hours. You are advised to take extra care of yourself/the child and guide him/her until he/she regains usual vision.

Participation in this study is voluntary. If you wish to withdraw at any point you may do so. Treatment and care of yourself or the participant will not be altered in any way. If you wish to take part in this study, please acknowledge.

Consent certificate form

I ……of …… hereby freely consent on behalf of the participant …… to participate in the above study. I acknowledge that the procedure and the side effects of eye drops have been explained to me thoroughly by Dr. ……I further state that the procedure that is to be done has been explained to me in a language I understand well and I have agreed for the examination to be done on the participant. I understand that the participation is voluntary.

Parent's/Guardian's signature…….....Date: ……...

Doctor's signature …….....Date: ……...

Contact information:

- ArgentinoA.Almeida+2540719421639(Email:argentinoalmeidaa0553@gmail.com)
- Comité Nacional de Bioética para Saúde, Moçambique (+258824066350)
- KNH/UoN Ethical Review committee Secretariat on (+254726300-9) (Email: uonknh_erc@uonbi.ac.ke).

Consentimento Informado

Eu Dr.Argentino, médico em Pos-graduação na Universidade de Nairobi, departamento de oftamologia, estou conduzindo um estudo para estabelecer as causas de cegueira entre os alunos que estão estudar na escola de deficiência visual da Beira em Moçambique. A informação obtido de estudo sera base de conhecimento das causas de cegueira da infância na Beira e todo Moçambique, isto também será útil na planificação de intervenções apropriadas para prevenção da cegueira evitável nas crianças.

A história da idade de início da perda visual, histórico familiar, histórico de consanguinidade e informações sobre doenças hereditárias, intra-uterino, Perinatal ou fatores de infância e cirurgia ocular anterior serão tomadas. Todos os alunos serão examinados pelo pesquisador principal (Dr. Argentino) e um oftalmologista qualificado.Acuidade visual (AV) uniocular e binocular serão medidos para cada aluno. Refração objetiva e subjetiva será feita para todos os alunos com menos de 6/18 AV. Avaliação geral será realizada para identificar deficiências adicionais. Exame do segmento anterior será feita com lanterna e uma simples lupa ou lâmpada de fenda portátil, se possível gotas para dilatação da pupila (Tropicamida / Mydriacyl) será usado para examinar o segmento posterior do olho. Gotas de dilatação da pupila pode causar irritações, redução transitória da visão até quarto horas. Aconselha-se a tomar cuidado extra de si mesmo / a criança e guiá-lo até que ele / ela recupere a visão habitual.

Declaração de cosentimento

Eu ……Encarregado/a ……., autorizo a/o……., a participar no estudo acima citado. Reconheço que o procedimento e efeitos secundários de gotas oculares a serem usado durante o exame foram explicado pelo Dr……, na língua que entendo bem e concordo com o teste ou exame ser feito a participante. Entendi que a participação é voluntária.

Assinatura de parente ou encarregado……Data…….

Assinatura do medico……Data……

Contact information:

- ArgentinoA.Almeida+2540719421639(Email:argentinoalmeidaa0553@gmail.com)
- Comité Nacional de Bioética para Saúde, Moçambique (+258824066350)
- KNH/UoN Ethical Review committee Secretariat on (+254726300-9) (Email: uonknh_erc@uonbi.ac.ke).

Assent Information

I, Dr Argentino of the Department of Ophthalmology, University of Nairobi, am conducting a study to establish the causes of blindness and visual impairment among students attending school for the blind in Beira, Mozambique. The information obtained from the study will give the baseline on childhood blindness in Beira and the whole of Mozambique. It will also be useful in planning appropriate interventions for prevention of avoidable causes and management of BL/SVI among students.

A history of the age at onset of visual loss, family history, history of consanguinity, and information about hereditary diseases, intrauterine, Perinatal or childhood factors and previous eye surgery will be taken. All the students will be examined by the principal investigator (Dr. Argentino) and a qualified ophthalmologist. Uniocular and binocular visual acuity (VA) will be measured for each student. Objective and subjective refraction will be done for all students with VA less than 6/18. General assessment will be carried to identify additional disabilities. Anterior segment examination will be done with torchlight and a simple magnifying loupe or portable slit lamp, if possible dilating drops (Tropicamide/Mydriacyl) and cycloplegic drops (Cyclopentolate) will be used to examine the posterior segment of the eye except where inappropriate. Dilating drops may cause mild irritation, transient blurring of vision and glare lasting up to four hours. You are advised to take extra care of yourself/the child and guide him/her until he/she regains usual vision.

Participation in this study is voluntary. If you wish to withdraw at any point you may do so. Treatment and care of yourself or the participant will not be altered in any way. If you wish to take part in this study, please acknowledge;

Assent certificate form

I ……of (school) …… hereby freely consent to participate in the above study. I acknowledge that the procedure and the side effects of eye drops have been explained to me thoroughly by Dr.. . ……I further state that the procedure that is to be done has been explained to me in a language I understand well and I have agreed for the examination to be done on myself. I understand that the participation is voluntary.

Parent's/Guardian's signature…….....Date: ……...

Doctor's signature …….....Date: ……...

Contact information:

- ArgentinoA.Almeida+2540719421639(Email:argentinoalmeidaa0553@gmail.com)
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- KNH/UoN Ethical Review committee Secretariat on (+254726300-9) (Email: uonknh_erc@uonbi.ac.ke).

Assentemento Informação

Eu Dr.Argentino, médico em Pos-graduação na Universidade de Nairobi, departamento de oftamologia, estou conduzindo um estudo para estabelecer as causas de cegueira entre os alunos que estão estudar na escola de deficiência visual da Beira em Moçambique. A informação obtido de estudo sera base de conhecimento das causas de cegueira da infância na Beira e todo Moçambique, isto também será útil na planificação de intervenções apropriadas para prevenção da cegueira evitável nas crianças.

A história da idade de início da perda visual, histórico familiar, histórico de consanguinidade e informações sobre doenças hereditárias, intra-uterino, Perinatal ou fatores de infância e cirurgia ocular anterior serão tomadas. Todos os alunos serão examinados pelo pesquisador principal (Dr. Argentino) e um oftalmologista qualificado.Acuidade visual (AV) uniocular e binocular serão medidos para cada aluno. Refração objetiva e subjetiva será feita para todos os alunos com menos de 6/18 AV. Avaliação geral será realizada para identificar deficiências adicionais. Exame do segmento anterior será feita com lanterna e uma simples lupa ou lâmpada de fenda portátil, se possível gotas para dilatação da pupila (Tropicamida / Mydriacyl) será usado para examinar o segmento posterior do olho. Gotas de dilatação da pupila pode causar irritações, redução transitória da visão até quarto horas. Aconselha-se a tomar cuidado extra de si mesmo / a criança e guiá-lo até que ele / ela recupere a visão habitual.

Declaração de assentimento

Eu …… da (Escola) .....aceito participar no estudo acima citado. Reconheço que o procedimento e efeitos secundários de gotas de vista foi bem explicado pelo Dr……, o procedimento que será feito foi explicado na língua que entendo. Percebi que a participação é voluntaria.

Participante.....……Data…….

Assinatura do medico……Data……

Contact information:

- ArgentinoA.Almeida+2540719421639(Email:argentinoalmeidaa0553@gmail.com)
- Comité Nacional de Bioética para Saúde, Moçambique (+258824066350)
- KNH/UoN Ethical Review committee Secretariat on (+254726300-9) (Email: uonknh_erc@uonbi.ac.ke).

REPÚBLICA DE MOÇAMBIQUE

MINISTÉRIO DA SAÚDE
COMITÉ NACIONAL DE BIOÉTICA PARA A SAÚDE
IRB00002657

Exmo Senhor
Dr. Argentino Albino Almeida

Ref: 339/CNBS/15 **Data 27 de Novembro de 2015**

Assunto: Parecer do Comité Nacional de Bioética para Saúde (CNBS) sobre o estudo: "*Causas de cegueira nos alunos que frequentam o Instituto de Deficientes Visuais da Beira, Moçambique*".

O Comité Nacional de Bioética para Saúde (CNBS) analisou as correcções efectuadas no protocolo intitulado: ***"Causas de cegueira nos alunos que frequentam o Instituto de Deficientes Visuais da Beira, Moçambique",*** Registado no CNBS com o número 84/CNBS/2015, conforme os requisitos da Declaração de Helsínquia,

Não havendo nenhum inconveniente de ordem ética que impeça a realização do estudo, o CNBS dá a sua devida aprovação aos seguintes documentos:

- Protocolo de estudo
- Instrumentos de recolha de dados
- Consentimento informado

Todavia, o CNBS informa que:

1- A presente aprovação não substitui a autorização administrativa.
2- Não houve declaração de conflitos de interesse por nenhum membro do CNBS.
3- A aprovação terá a validade de um ano, terminando esta a 27 de Novembro de 2016. Os investigadores deverão submeter o pedido de renovação da aprovação um mês antes de terminar o prazo.
4- Recomenda-se aos investigadores que mantenham o CNBS informado do decurso do estudo.
5- A lista actualizada dos membros do CNBS esta disponível na secretaria do Comité.

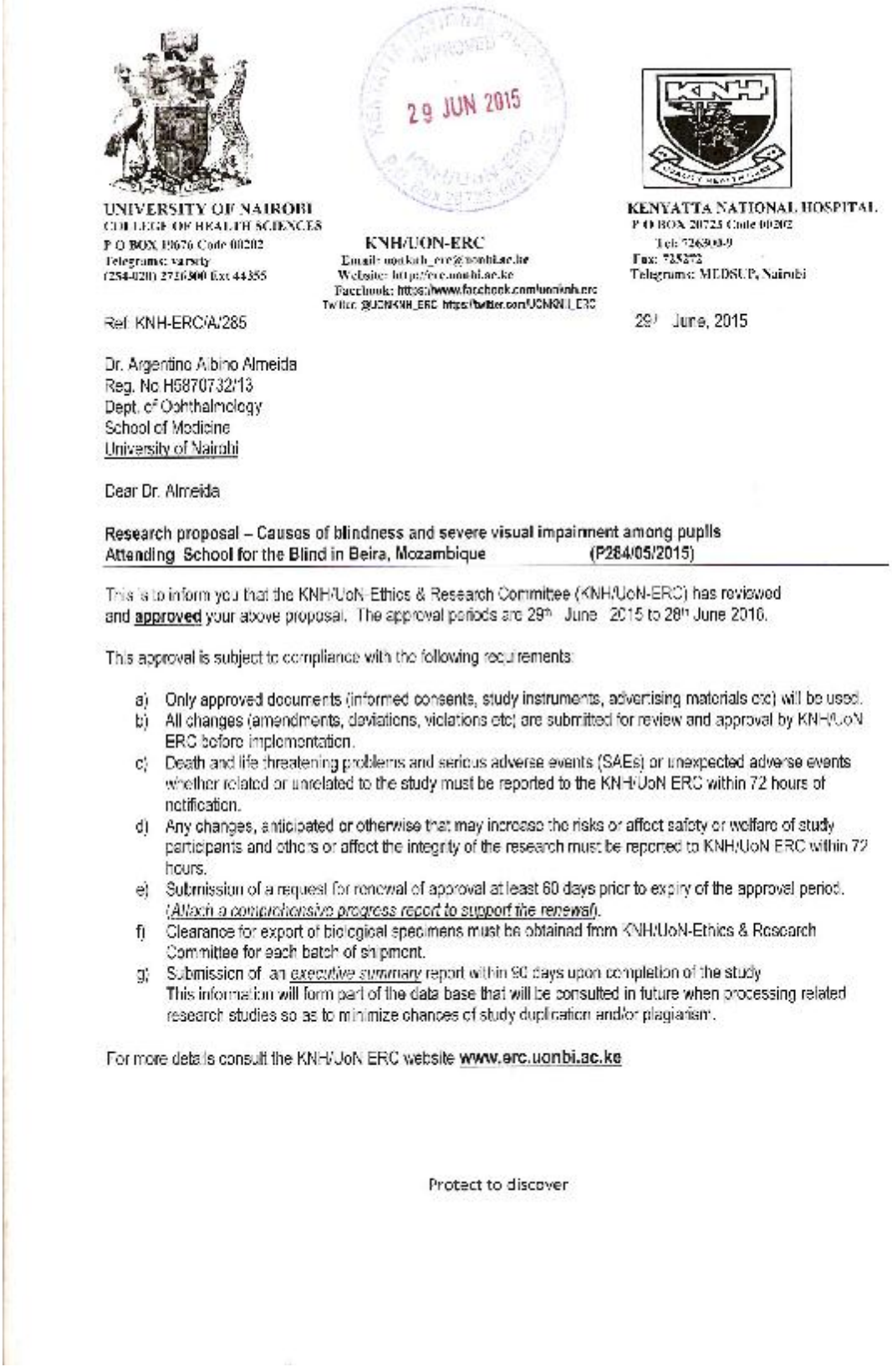
O Presidente

Dr. João Fernando Lima Schwalbach

ENDEREÇO:
MINISTÉRIO DA SAÚDE
C. POSTAL 264

Telefones: 430814/427131(4)
Telex: 6-239 MISAU MO
FAX: 258 (1) 426547

Appendix VI: Ethical Approval Certificates



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29 JUN 2015

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Website: http://erc.uonbi.ac.ke
Facebook: https://www.facebook.com/uonknh.erc
Twitter: @UONKNH_ERC https://twitter.com/UONKNH_ERC

KENYATTA NATIONAL HOSPITAL
P O BOX 20723 Code 00202
Tel: 7269000
Fax: 725272
Telegrams: MEDSUP, Nairobi

Ref: KNH-ERC/A/285

29th June, 2015

Dr. Argentino Albino Almeida
Reg. No H58/0732/13
Dept. of Ophthalmology
School of Medicine
University of Nairobi

Dear Dr. Almeida

Research proposal – Causes of blindness and severe visual impairment among pupils Attending School for the Blind in Beira, Mozambique (P264/05/2015)

This is to inform you that the KNH/UoN Ethics & Research Committee (KNH/UoN-ERC) has reviewed and **approved** your above proposal. The approval periods are 29th June 2015 to 28th June 2016.

This approval is subject to compliance with the following requirements:

a) Only approved documents (informed consents, study instruments, advertising materials etc) will be used.
b) All changes (amendments, deviations, violations etc) are submitted for review and approval by KNH/UoN ERC before implementation.
c) Death and life threatening problems and serious adverse events (SAEs) or unexpected adverse events whether related or unrelated to the study must be reported to the KNH/UoN ERC within 72 hours of notification.
d) Any changes, anticipated or otherwise that may increase the risks or affect safety or welfare of study participants and others or affect the integrity of the research must be reported to KNH/UoN ERC within 72 hours.
e) Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. (*Attach a comprehensive progress report to support the renewal*).
f) Clearance for export of biological specimens must be obtained from KNH/UoN-Ethics & Research Committee for each batch of shipment.
g) Submission of an *executive summary* report within 90 days upon completion of the study. This information will form part of the data base that will be consulted in future when processing related research studies so as to minimize chances of study duplication and/or plagiarism.

For more details consult the KNH/UoN ERC website **www.erc.uonbi.ac.ke**

Protect to discover

REPÚBLICA DE MOÇAMBIQUE

MINISTÉRIO DA SAÚDE

Gabinete do Ministro

Excelentíssimo Senhor
Argentino Albino Almeida

MAPUTO

Nota nº 14 /GMS/ 052 /015

Assunto: **Resposta a solicitação de autorização para a realização do estudo intitulado ``Causas de Cegueira nos alunos que frequentam o Instituto de Deficientes Visuais da Beira´´.**

Excelentíssimo Senhor,

Incumbe-me S.Excia Vice Ministro da Saúde, ***Dr. Mouzinho Saíde***, de acusar a recepção do vosso documento datado de 14 de Dezembro de 2015, na qual solicita autorização para o início do estudo acima citado, tenho a informar que o despacho recaído tem o seguinte teor:

``**Autorizo**
Assinado Dr. Mouzinho Saíde
(30/12/2015)

Sem mais de momento, as minhas cordiais saudações.

Maputo, aos 31 de Dezembro de 2015

O Chefe do Gabinete

Tiago Macuácua