PATTERN AND MAGNITUDE OF CONGENITAL AND DEVELOPMENTAL CATARACT AMONG CHILDREN ATTENDING MUHIMBILI NATIONAL HOSPITAL PAEDIATRIC EYE CLINIC

Ntsilane Suzan Mosenene. MD

M. Med (Ophthalmology) Dissertation

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BY

Ntsilane Suzan Mosenene. MD

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CERTIFICATION

The undersigned certify that they have read and hereby recommend for acceptance by the Muhimbili University of Health and Allied Sciences a dissertation entitled: ***Pattern and magnitude of congenital and developmental cataract in children attending Muhimbili National Hospital paediatric eye clinic,*** in Dar es Salaam Tanzania, in partial fulfillment of the requirements for the degree of Master of Medicine (Ophthalmology).

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DR A. SANYIWA (MD, MED.OPHT, MPH)

(Supervisor)

Date 29th November 2010

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PROF.J. L. F. SANGAWE (Consultant Ophthalmologist)

(Supervisor)

Date 29th November 2010

DECLARATION AND COPYRIGHT

I Ntsilane Suzan Mosenene 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 other degree award.

Signature; ..... Date..29-November-2010.....

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DEDICATION

To my beloved late grandmother Alice Mamorakane Mosenene for the love and trust she had in education.

To my Husband and children, for all the sacrifices they have made.

ABSTRACT

Background

Congenital and developmental cataract affects children from birth up to 16 years of age. When cataract not treated on time can results in blindness or severe visual impairment in these children. Loss of vision in children has an impact in their education, employment and social life. This is the first study to be done in MNH paediatric eye clinic. This study is expected to provide baseline information on the pattern and magnitude of congenital and developmental cataract and to determine the prevalence of associated systemic anomalies among these children.

Objectives: This study was designed to determine the prevalence, clinical presentation and etiologies of congenital and developmental cataract among children attending Muhimbili National Hospital Pediatric Eye Clinic.

Methods: This was a cross sectional descriptive hospital based study, conducted from June 2009 to January 2010. During the period under study children referred from different parts of Tanzania with visual problems were screened for congenital and developmental cataract. Best corrected visual acuity was done according to the patient's age. Pupil dilation was done to facilitate better view of the lens morphology on slit lamp examination, cycloplegic refraction and fundoscopy where lens was less opaque. All children under study had their blood taken for rubella toxoplasmosis and HIV antibodies. SPSS version 15 was used for data entry, cleaning and statistical analysis.

Results: A total of 1213 children from zero to 192 months of age were screened for cataract in MNH paediatric eye clinic whereby the overall prevalence of cataract was found to be 4.8%. Among 116 eyes of 58 patients 87% eyes were found to have cataract. Congenital cataract had a prevalence of 1.6% and developmental cataract 3.1%. Majority 57.5% of children below 24 months of age were blind. Bilateral cataract was more common in both age groups 44 (75.9%). Most of these patients with unilateral and bilateral cataract had negative blood results for

rubella and toxoplasmosis antibodies. However those patients with positive blood results for rubella and toxoplasmosis had high prevalence of bilateral cataract. Congenital heart disease was observed in 3 patients with positive rubella antibodies. Thirty nine eyes were found to have lamellar cataract and 38.5% of these had moderate visual impairment. Among 116 eyes examined, 55 eyes were blind. Total cataract was the commonest morphological characteristic observed in 47 eyes. More than half of the patients 56.9% had undetermined causes of cataract.

Conclusion

This study has found that rubella and toxoplasmosis are still important causes of congenital and developmental cataract. This is of great concern in the prevention of these infections. These findings also highlight the effort of vision 2020 to focus on these infections in developing countries like Tanzania. The results from this study highlight that childhood cataract is an important cause of childhood blindness especially in the first 24 months of age.

ABBREVATIONS

A/C	Anterior Chamber
CNS	Central Nervous System
CRS	Congenital Rubella Syndrome
HIV	Human immunodeficiency virus
IgG	Immunoglobulin G
IgM	Immunoglobulin M
IOP	Intraocular Pressure
LE	Left Eye
MNH	Muhimbili National Hospital
MUHAS	Muhimbili University of Health and Allied Sciences
PHPV	Persistent Hyperplastic Primary Vitreous
RV	Rubella Virus
RE	Right Eye

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INTRODUCTION

Childhood blindness is blindness occurring from birth to sixteen years. It is caused by a group of diseases and conditions occurring in childhood or early adolescence, which if left untreated results in blindness or severe visual impairment that cannot be treated later in life [1, 2].

The prevalence of blindness among children in different regions varies from 0.2/1000 children to over 1.5/1000 children, with a global figure estimated at 0.7/1000 [1]. There is an estimation of 1.4 million blind children worldwide. The proportion of blindness in children due to cataract varies between regions from 10%-30% with a global average estimated at 14%, giving 190,000 children blind from cataract [1].

Children who are blind have to overcome a lifetime of emotional, social and economic difficulties, which affect the child, the family and society at large. Loss of vision in children influences their education, employment and social life. Childhood blindness is second only to adult cataract as a cause of blind-person years. Approximately 70 million blind-person years are caused by childhood blindness of which about 10 (14%) million blind-person years are due to childhood cataract [1].

Cataract is defined as any light scattering opacity in the lens, not necessarily with any demonstrable effect on vision. It is classified according to the etiology as congenital, age related, secondary and drug induced cataract. Others are traumatic, associated with metabolic, nutritional diseases and infectious diseases [2, 3, 4].

Congenital cataract is apparent at birth or from the first twenty four months of age [2]. It is due to different causes like infections which the mother acquired during the first trimester of her pregnancy. These infections are known to be teratogenic to the developing fetus [2]. Other causes include teratogenic drugs which were used by the mother in the first trimester of gestational age which interfere with normal development of the fetus. Other causes include metabolic diseases in children, genetic abnormalities and idiopathic [2, 5].

Among infectious causes of congenital and developmental cataract, rubella infection account for 15-20% of congenital cataract in Africa which shows poor control of this disease in developing countries [5]. Rubella virus(RV) is known to cause mild disease, while maternal infection by RV in early pregnancy often leads to birth defects known as congenital rubella syndrome (CRS) [3, 4, 6].

Literature shows that congenital rubella syndrome has cataract as the most frequent ocular presentation seen. However different countries of the world are engaged to eliminate rubella and congenital rubella syndrome. Rubella infection is known to affect 100 000 children worldwide every year [6].

Apart from the above mentioned causes, one third of peadiatric cataracts are sporadic. They are not associated with any systemic or ocular diseases. However there may be spontaneous mutations which may lead to cataract formation in the patient's offspring. Twenty per cent of congenital cataracts are familial and most frequent mode of transmission is autosomal dominant with complete penetrance [2].

Developmental cataract is a type of cataract which develops in a period of two years or more in an eye of the child who had normal eye at birth and normal development of the visual pathway [5, 7].

It is estimated that the incidence of cataract is about 0.4% in newborns and the majority is not associated with poor vision, especially if the cataract is small, in the anterior portion of the lens or in the periphery. However when a dense cataract is undetected in an infant, permanent visual loss may occur. The presence of lens opacity in the visual axis is considered visually significant in reducing visual acuity and leads to blindness in these children [2].

Clinical presentation of congenital and developmental cataract is characterized by presence of lens opacity that can be seen from birth or few years after, as a white pupil (leukocoria) which can be unilateral or bilateral. In unilateral cataract lens opacity may delay to be noticed because these children tend to use an eye with good vision and might not realize that the other

eye does not see well until when a good eye is occluded. In bilateral cataract one eye maybe affected more than the other eye and the brain suppresses vision on the eye with poor vision, a patient learn to use an eye with good vision, while an eye with poor vision when not used will then develop into amblyopia and visual loss[2, 5].

Morphological classification is done according to the area of the lens involved, and sub-dividing them by a detailed description of the shape and appearance. Each specific morphological type is analyzed determining the etiology, visual prognosis, and management [7, 8]. For instance anterior polar cataracts are usually small, bilateral, symmetric, non-progressive opacities that do not impair vision and they are frequently inherited. Anterior polar cataracts are sometimes seen in association with ocular abnormalities like microphthalmos, persistent pupillary membrane and anterior lenticonus [3, 4, 8].

Posterior polar cataracts are sharply defined opacities of the sub-capsule cortex. They are known to affect vision because they tend to be larger and are located near the nodal point of the eye. The cause of opacity may be due to imperfect separation of the lens from the surface ectoderm, due to epithelial damage or poor re-absorption of the vascular tunic of the lens which reflect its origin [3, 4, 8].

Lamellar cataract is also known to be an inherited type of cataract, it may be due to metabolic or infectious causes [3,4,8]. They are characteristically bilateral and symmetrical, they may affect the vision if very dense. They are also known to be inherited as an autosomal dominant trait [3,4].

Mittendorf's dot is characterized by opacity of about 1mm diameter located in the posterior pole of the lens capsule, and lie inferonasally. It may be attached to the remnant of the hyaloid artery in the vitreous gel. It is non-progressive [3,4].

Cataract during childhood period can involve the whole lens, in which case they are called total, morgagnian, or disc-like. They can affect only the center of the lens; lamellar, nuclear, oil droplet, cortical or coronary. They can be anterior; anterior polar, anterior subcapsular or

anterior lenticonus. The posterior aspect of the lens can also be affected in different fashions; (ie) Mittendorf's dot, posterior lenticonus, posterior cortical cataract or subcapsular [4,7,8].

Cataract can be associated with other ocular anomalies like coloboma of iris, lens, choroid and optic disc. Other ocular associations are aniridia, microcornea and persistent fetal vasculature [4].

Syndromic cataract is associated with systemic syndromes or dysmorphic features. Metabolic cataract is associated with galactosemia or hyperglycemia based on biochemical tests. In hereditary cataract, there is a family history of cataract. Other forms of cataract are due to maternal infections like rubella and toxoplasmosis. Complicated cataracts are those with history of intraocular inflammation or drugs taken like steroids. Idiopathic cataract is a type of cataract that the causes cannot be determined [7, 8].

LITERATURE REVIEW

Epidemiology

Recent studies in childhood blindness estimates that 20% of blindness is due to cataract. Literature suggests that in a typical developing country with no rubella immunization and limited or no paediatric ophthalmology services, there are likely to be about 80–100 children per one million total population blind due to congenital cataract. Incidence can probably best be calculated based upon number of live births [5].

It is estimated that there are 200 000 children worldwide blind from cataract and 20 000–40 000 children are born each year with congenital cataract [9, 10]. Globally the incidence of cataract in children has been reported as 1–15/10 000 live births [11]. In Eastern Africa studies done in schools for the blind in Malawi, Kenya and Uganda found that 13.1%, 9.1%, and 27.6% of children were blind from cataract [12].

The available literature shows that there are significant reductions in preventable causes of blindness like measles and vitamin A deficiency, while cataract is becoming the major cause of treatable blindness in children from developing countries [13, 14].

It is estimated that congenital cataract account for 3:10 000 live births and two thirds of cases are bilateral [15]. A study conducted in Denmark on congenital/infantile cataract, found 64% of the study population to have bilateral cataract [16].

In Malawi and East Africa, congenital cataract was found to be the leading cause of the total cataract seen among children with cataract and bilateral cataracts were more frequent than unilateral cataracts [17]. In London, U.K. a five years study in children with cataract before one year of age found the majority of cataract to be bilateral [18]. This shows that the majority of congenital cataract is bilateral, independent of the geographic region.

Etiology

Literature report that one third of congenital cataract is heritable, while one third is of unknown etiology and the last one third is associated with systemic syndromes [4]. In U.K a study on newly diagnosed congenital and infantile cataract showed hereditary diseases to be associated with 56% of bilateral cataract and 6% of unilateral cases [10]. In Denmark about two third of congenital cataract had an unknown etiology and was associated with a higher proportion of unilateral cataract and an additional ocular anomalies compared with cases of known etiology [16].

Majority of the studies done in different countries of the world have established that, most of the cataracts are of unknown etiology. A study in northern India on morphological patterns and etiology of congenital cataract reported idiopathic cataract to be the most common cause of congenital cataract occurring in 46% of cases [19].

In a study on etiology of congenital and pediatric cataract in Australian population, eighteen percent (18%) of the patient who underwent this study were found to have a positive family history of cataract. The study conclusion was that there was an association between inheritance and congenital cataracts [20].

A study on Genetic examination in cases of congenital cataract showed bilateral congenital cataract to be more frequent in genetic than other forms of cataract and unilateral congenital cataract was associated with sporadic form of cataract. The mode of inheritance was mostly autosomal dominant but autosomal recessive and X-linked modes were also identified [21].

Another literature on etiology of congenital cataracts found sixty two percent of cases, whereby hereditary etiology was the most common cause of congenital cataract about forty two percent(42%) of the etiologies [22].

Intrauterine infections are also known to be the other causes of congenital cataract especially if the infection occurs in the first trimester of pregnancy [3]. In Chicago a study on

toxoplasmosis and rubella reported prenatal infections and other systemic factors in only 6% of bilateral and 2% of unilateral cases [10]. Moreover other literatures report cataract caused by maternal infections to be less observed than expected [16, 19].

A study on infants suspected of having congenital infections in India, where by the serum samples of the infants who underwent the study were tested for rubella specific IgM antibodies fifteen percent (15.2%) were found to be positive for IgM antibodies to rubella virus. The commonest clinical presentation in infants with IgM antibodies to rubella virus was bilateral congenital cataract [23]. Study on congenital cataract etiology in Tunisia, reported intrauterine infections in seven percent (7%) and 4.7% of cases respectively [24].

Morphology

The morphology of congenital cataract reflects a combination of the timing and the nature of the cause, the anatomy of the lens including its capsule, its development and changes that take place with time [8]. Visual outcome and complications of cataract can sometimes be predicted based on morphological characteristic of cataract [8].

A study of congenital cataract in northern India on morphological patterns and etiology of cataract found partial cataracts to be three times more common than total cataract, the lamellar types were the most common among the partial cataract [19].

A study done in west India reported different morphological presentations whereby total cataract was the most common presentation, followed with mixed cataract and lamellar cataract in 21.05%. Other morphological characteristics were nuclear cataract in 8.55%, posterior polar and posterior capsule cataracts [22].

A study done in Chicago to determine the incidence and natural history of cataract in children with congenital toxoplasmosis found different locations of the cataracts including anterior polar in three eyes, anterior sub capsular in six eyes, nuclear in five eyes, posterior sub capsular in seven eyes, and unknown in six eyes. Thirteen cataracts were partial, nine total,

and five with unknown complexity. The study conclusion was that there was considerable variability in the presentation, morphology, and progression of the cataracts. The authors also concluded that associated intraocular pathology is an important cause of morbidity [25].

Associated systemic and ocular anomalies

About one third of cataract is associated with systemic syndromes. A study on detection of congenital and infantile cataract in U.K. found twenty five percent (25%) of cataract to be associated with systemic disorders [10]. A study on congenital cataract in northern India reported strabismus and nystagmus were the most common associated ocular abnormalities about 28.94% and 15.79%, respectively and mental retardation was the most commonly associated systemic abnormality [19].

A study in Chicago to determine the incidence and natural history of cataract in children with congenital toxoplasmosis on 27 eyes with cataract surgery, showed two patients to have developed glaucoma. Sixteen eyes of eleven patients had retinal detachment and cataract [25].

An epidemiological and clinical study of ocular manifestations of congenital rubella syndrome in Omani children reported 30% of the patients had cataract which also prove the strong association of rubella infection and cataract [27]. In a nationwide survey of deaf children with a history of maternal rubella in Japan among 365 cases who had deafness, 8.2% were found to have cataract with and without congenital heart disease and 11.0% were found to be complicated by congenital heart disease but without cataract [28].

Different literatures show a strong association of congenital rubella syndrome and cataract. In England a study on congenital rubella syndrome, reported ophthalmic manifestations and associated systemic disorders in congenital rubella syndrome, to have a wide variety of severe ophthalmic and systemic complications. This study was done for a period of 20 years follow up. Ocular disease was the most commonly noted disorder occurring in about 78% of the cases. Cataracts and microphthalmia were significantly correlated with poor visual acuity [29].

Measuring vision in children

Children with normal visual development have the tendency to look at their mothers face and are more interests on objects in their surroundings. The presence of cataract is known to cause visual deprivation in these children and lead to amblyopia [5].

The choice of vision test depends on child's age, ability, milestones and child behavior. Preverbal children can not tell what they see and preferential looking is the best method used to assess their vision [5].

An infant of 9 months can easily pick up a tiny sweet at a distance of 30cm and this will indicate normal vision but in case that the child does not have a clear vision will always fumble [5]. Above 2 years old these children can talk and match pictures. Children above 3 years old, Sheridan gardener is used to match the letters while children above 4 years old an E chart or snellen chart is used to measure their visual acuity [5].

Grating acuity (Lea gratings) is the method used in children of 0-24 months of age. Visual behavior, ability to fix and follow objects, hundreds and thousands. Cardiff cards are used to older children of 18-60 months and visual acuity in these cards is converted in to Snellen equivalent. Cardiff card done at 50cm to one meter has Snellen equivalent visual acuity of 6/12 to 6/120 [29].

STATEMENT OF THE PROBLEM

It has been estimated that there are 1.4 million blind children in the world, 1 million of whom live in Asia and 300 000 in Africa. The prevalence ranges from 0.3/1000 children aged 0–15 years in developed countries to 1.5/1000 children in very poor communities. Most blind children are either born blind or become blind before their fifth birthday. The number of children who are blind per 10 million populations varies from approximately 600 in developed countries to approximately 6000 in very poor communities. About 40% of the causes of childhood blindness are preventable or treatable [1].

In developing countries, high proportions of children are blind from preventable causes, which require community-based interventions. In all regions, children with treatable diseases, principally cataract, can have their sight saved by preventing the causes [1]. Health programmes like VISION 2020 have been established to assist developing countries to eliminate blindness due to cataract in children by performing more cataract surgeries. Under VISION 2020, tertiary peadiatric ophthalmology centres have been set up to offer comprehensive eye care services to children. One of such centre is the paediatric ophthalmic clinic at MNH which started in July 2007.

It is important to have baseline data on the clinical presentation of cataract seen in this clinic. There is no baseline information available on the causes, morphology, associated ocular disorders and systemic syndromes associated with congenital cataract, among the patients seen in this clinic and in Tanzania at large. However there are no available data on magnitude and pattern of congenital and developmental cataract in MNH paediatric eye clinic.

This study is designed to determine the pattern and magnitude of congenital and developmental cataract to provide baseline information. This baseline information will result in improved patient healthcare, including health programmes for preventable causes of childhood cataract.

RATIONALE FOR THE STUDY

The study findings will provide baseline information which is important for planning an improved treatment and care for cataract in children. The findings on clinical presentation, etiologies and morphological pattern of congenital and developmental cataract will facilitate early diagnosis, management and prevention of congenital and developmental cataract.

STUDY QUESTIONS

1. What is the proportion of children with congenital and developmental cataract among children attending MNH paediatric eye clinic?

2. What are the etiologies and morphological characteristics among patients with congenital cataract seen at Muhimbili Paediatric Eye clinic?

STUDY OBJECTIVE

Broad objective;

To determine the prevalence and clinical presentation of congenital and developmental cataract among children attending MNH Pediatric Eye Clinic.

Specific objectives

1. To determine the prevalence of congenital and developmental cataract among patients attending MNH paediatric eye clinic.

2. To determine the clinical signs and symptoms of children presenting with congenital and developmental cataract at MNH.

3. To determine prevalence of associated systemic anomalies among children with congenital and development cataract at MNH.

METHODOLOGY

Study Area;

This study was conducted at Muhimbili Paediatric Eye clinic in Muhimbili National Hospital Dar-es-salaam, Tanzania, from June 2009 to January 2010.

Muhimbili Pediatric Eye clinic is part of the ophthalmology department and it is located at the paediatric building at Muhimbili National Hospital. The paediatric eye clinic was set up by the collaboration between the MOHSW, MUHAS and SSI as part of the nation's strategy to implement VISION 2020 objective of eliminating avoidable childhood blindness in Tanzania. The clinic serves a population of about 10 million from different regions like Dar-Es-Salaam, Coast region, Morogoro and Zanzibar. Other children are referred from the country at large. The paediatric out patient clinics are conducted on Mondays and Fridays from 8.00 am to 4.00 pm with a maximum number of twenty patients per day and a minimum of one cataract patient per clinic.

Muhimbili National Hospital is a tertiary care hospital which is situated in the middle of the Dar-es-salaam city in Tanzania, with a population of 4,000, 000 estimated in year 2009. Muhimbili National Hospital is a teaching hospital for the Muhimbili University of Health and Allied Sciences.

The hospital serves the whole country as a referral hospital, and has services for in-patient and out-patients with a maximum of 1000 patients seen a day and 1000 patients admitted weekly. The Muhimbili National hospital is the only government hospital with paediatric eye services in Tanzania.

Study design;

This was a cross- sectional descriptive study.

Study population:

A total of 1213 children aged 0-192 months of age, referred from different hospitals of Tanzania were screened for congenital and developmental cataracts by the investigator under the supervision of the paediatric ophthalmologist.
The children diagnosed to have cataract were recruited in the study. the study was done between June 2009 and January 2010.

Data collection:

Data was collected using a structured questionnaire. All parents who their children were diagnosed to have congenital or developmental cataract at MNH paediatric eye clinic were informed about the study. Informed consent was then signed by the parents or guardians before the patients were included in this study.

Interrogation to the parents or guardian and physical examination was conducted to all children with diagnosis of cataract in order to identify any systemic disease associated with cataract. Children with systemic problems were reviewed by the paediatrician. Patients were then scheduled for cataract surgery when fit for surgery.

An ocular examination was performed under supervision by the paediatric ophthalmologist initially by taking the visual acuity and using different methods according to patient's age. Visual acuity assessment was done with the assistance of optometrist trained in visual assessment and refraction in children. Snellen letters and E letters were used for children above 5years of age. Younger children were examined by fixing and following of the objects, Cardiff cards and Kay pictures respectively. Pen torch was used in all those children who their visual acuity could not be determined by any of the above mentioned methods, in order to identify if these children were able to perceive light or not.

For slit lamp bio-microscopy examination the parents and myself held the babies in the babies in such a way that the head was placed on a slit lamp for the paediatric ophthalmologist to

examine the anterior segment of the eye. This included the conjunctiva, cornea, anterior chamber, iris, pupil, lens morphology and vitreous were all examined for any ocular anomalies.

Tropicamide 0.5% and atropine 1% eye drops were used to dilate the pupil for better visualization of the cataract, posterior segment. An indirect ophthalmoscope was used for examination of the retina in those patients who had less dense cataract. Best corrected visual acuity was done after cycloplegic refraction.

All children under study had blood sample taken for rubella, toxoplasma, HIV and syphilis antibodies by using disposable sterile syringes and needles and send to the laboratory. The results of the blood tests were then recorded in the data sheet.

Inclusion criteria:

All patients aged 0-192 months of age with congenital and developmental cataract whose parents /guardian consented on their behalf to participate in this study were included.

Exclusion criteria:

All those children with congenital or developmental cataract who their parents did not want them to participate in the study were excluded.

Those children with traumatic cataract were not included in this study.

Sampling

Study sampling used in this study was convenient sampling. All patients with congenital and developmental cataract attended during the period of study were recruited for the study.

Data management and analysis

Data entry and analysis was done by using SPSS version 15. Data cleaning was done using the same software. Frequency distribution was used to determine prevalence of the conditions under study.

Two way tables and chi square test were used to asses association between the dependent and independent variables using the EPI INFO6. P values of 0.05 or less was considered to be significant.

Ethical Issues;

The study was conducted after the permission from the ethical committee of MUHAS. A written informed consent was signed by parents or guardian who allowed their children to be part of the study. Those children who were found to have other systemic problems apart from congenital and developmental cataract were evaluated by paediatrician before any surgical procedure by the paediatric ophthalmologist.

RESULTS

A total of 1213 children aged zero to 192 months were screened for congenital and developmental cataract in MNH paediatric eye clinic from June 2009 to January 2010. Of these fifty eight (4.8%) children had congenital and developmental cataract.
The prevalence of congenital cataract was (1.6%) and developmental cataract was (3.1%).

Almost one third of the children with cataract were aged 24 months or less. Male children were the commonest to have cataract, however the results were not statistical significant. P. Value = 0. 20 (Table: 1).

Table: 1. Distribution of study participants by Age and Sex

Age group	Male n (%)	Female n (%)	Total N (%)	P. value
0 - 24 months	13 (65)	7 (35)	20 (34.5)	
				0.20
>24 months	18 (47.4)	20 (52.6)	38 (65.5)	
Total	**31 (53.4)**	27 (46.6)	58 (100)	

The commonest symptom reported by parents was poor vision. Nystagmus was the least ocular sign observed among these patients. (Figure.1)

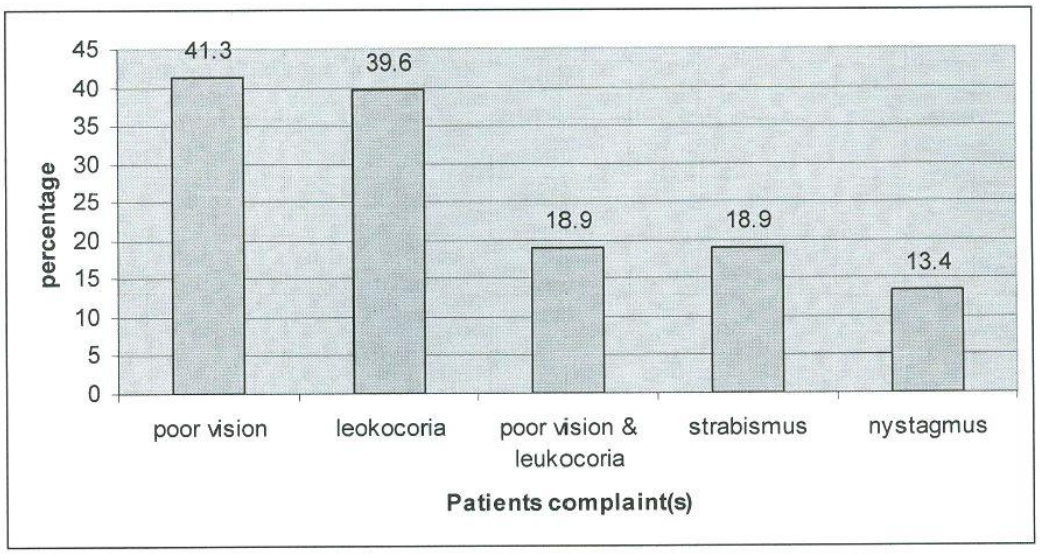

Figure.1: Distribution of symptoms and signs of patients.

Bilateral cataract was more common in both age groups. Unilateral cataract was more observed among age group below 24 months of age. The results were not statistically significant between the age groups (Table: 2).

Table: 2. Cataract Laterality by Age

Age group	Unilateral n (%)	Bilateral n (%)	Total N (%)	P. value
0 - 24 months	6 **(30)**	14 (70)	20(34.5)	
>24months	8 (21.1)	30 (78.9)	38(65.5)	0.66
Total	14 (24.1)	44 **(75.9)**	58 (100)	

Table: 3 show distribution of cataract laterality by blood results. Majority of patients with unilateral cataract had negative blood results. Most of the patients with toxoplasmosis and rubella had bilateral cataract. (Table:3)

Table: 3. Distribution of Cataract Laterality by Blood Results.

Cataract laterality	Negative n (%)	Rubella n (%)	Toxoplasmosis and rubella n (%)	Toxoplasmosis n (%)	HIV n (%)	Total N(%)
Unilateral	9 **(64.3)**	3 (21.4)	1 (7.1)	0 (0)	1 (7.1)	14(34.5)
Bilateral	24 (54.5)	12 (27.3)	7 **(15.9)**	1 (2.3)	0 (0)	44(65.5)
Total	33(56.9)	15(25.9)	8 (13.8)	1 (1.7)	1(1.7)	58(100)

Fifty five (47.4%) eyes were blind with corrected visual acuity of less than 3/60. Almost one fifth of the eyes among age group above 25 months of age had severe visual impairment. The study findings were statistically significant with P. value of 0.001 (Table: 4).

Table: 4. Distribution of Best Corrected Visual Acuity by number of Eyes

Age	>6/18 n (%)	6/24 – 6/60 n (%)	>6/60 – 3/60 n (%)	< 3/60 N (%)	Fix and follow n (%)	Total N (%)	P. value
0 - 24 months	1 (2.5)	1 (2.5)	1 (2.5)	23 **(57.5)**	14 (35)	40	**0.001**
>24 months	12 (15.8)	23 (30.1)	9 (12)	32 **(42.1)**	*	76	
Total	13 (11.2)	24 (20.7)	10 (8.6)	55 (47.4)	14 (24.1)	116 (100)	

** fixing and following was only observed in children below 24 months of age; not included in analysis.*

The less frequent cataract morphology observed was anterior polar cataract eyes. The commonest morphological characteristic was total cataract . Lamellar cataract was more common among the age groups above 25 months of age. Results were not statistically significant. (Table: 5).

Table: 5. Cataract Morphology by Total Number of Eyes

Age	Normal lens n (%)	Anterior polar cataract n (%)	Lamellar cataract n (%)	Nuclear cataract n (%)	Posterior capsule cataract n (%)	Total cataract n (%)	Total N (%)
0 – 24 months	7(17.5)	1 (2.5)	8(20)	1 (2.5)	0(0)	23 (57.5)	40(34.5)
> 24 months	8(10.5)	1(1.3)	**31(41)**	2(2.6)	10(13.2)	24(31.6)	76(65.5)
Total	15(12.9)	**2(1.7)**	39(33.6)	3(2.6)	10(8.6)	**47(40.5)**	116 (100)

Eyes with anterior polar cataract had good visual acuity. Majority of the eyes with lamellar cataract had moderate visual impairment. About 80.8% of eyes with total cataract had visual blindness. Visual blindness was observed in 47.4% eyes.

Table: 6. Distribution of Cataract Morphology by Visual Acuity of Both Eyes

Cataract morphology	>6/18 n (%)	6/24-6/60 n(%)	>6/60-3/60 n(%)	<3/60 n(%)	Fix and follow n(%)	Total N(%)
No cataract	6(40)	1(6.7)	0(0)	2(13.3)	6(40)	15(12.9)
Anterior polar	1**(50)**	0(0)	0(0)	0(0)	1**(50)**	2(1.7)
Lamellar	5(12.8)	15**(38.5)**	7(17.9)	9(23.1)	39(7.7)	39**(33.6)**
Nuclear	0(0)	0(0)	0(0)	2(66.7)	1(33.3)	3(2.5)
Posterior capsule	0(0)	6(60)	0(0)	4(40)	0(0)	10(8.6)
Total cataract	1(2.1)	2(4.3)	3(6.4)	38**(80.8)**	3(6.4)	47**(40.5)**
Total	13(11.2)	24(20.7)	10(8.6)	55**(47.4)**	14(12.1)	116(100)

Ten eyes with negative blood results had no cataracts. More than half of the eyes with lamellar cataract had a negative blood results (58.9%). Thirty percent of the eyes with total cataract had positive rubella antibodies (Table: 7).

Table: 7. Distribution of Cataract Morphology by Blood Results.

	Blood results					
Cataract morphology	Negative n (%)	Rubella n (%)	Toxoplasmosis and rubella n(%)	Toxoplasmosis n (%)	HIV N (%)	Total N (%)
No cataract	**10 (66)**	3 (20)	1 (7)	0 (0)	1 (7)	15 (12.9)
Anterior polar	1 (50)	1 (50)	0 (0)	0 (0)	0 (0)	2 (1.7)
Lamellar	**23 (58.9)**	5 (12.8)	10 (25.6)	0 (0)	1 (2.6)	39 (33.6)
Nuclear	0 (0)	**3 (100)**	0 (0)	0 (0)	0 (0)	3 (2.6)
Posterior capsule	4 (40)	4 (40)	2 (20)	0 (0)	0 (0)	10 (8.6)
Total cataract	28 (60)	**14 (30)**	3 (6)	2 (4)	0 (0)	47 (40.5)
Total	66 (56.9)	30 (25.9)	16 (13.8)	2 (1.7)	2 (1.7)	116(100)

Thirty three patients had negative blood results. Fifteen patients had positive rubella antibodies. Patients below 24 months of age were more affected by rubella. The second most common positive blood result was rubella with toxoplasmosis found in 8 patients and majority of those patients affected by rubella and toxoplasmosis were above 24 months of age. (Table: 8).

Table: 8. Distribution of Blood Results by Age.

Age	Negative blood n (%)	Rubella n (%)	Rubella + toxoplasmosis n (%)	Toxoplasmosis n (%)	HIV n (%)	Total N (%)
0 – 24 months	12 (60)	**6 (30)**	1 (5)	0 (0)	1 (5)	20 (34.5)
>24 months	21 (55.3)	9 (23.7)	**7 (18.4)**	1 (2.6)	0 (0)	38 965.5)
Total	**33 (56.9)**	**15 (25.9)**	8 (13.8)	1 (1.7)	1 (1.7)	58 (100)

A total of 7 (12.1%) patients had associated systemic conditions. Four (6.9%) patients had positive blood results for rubella antibodies. Congenital heart disease was the most common associated systemic condition, observed in 3 (5.2%) patients with positive rubella antibodies.

DISCUSSION

This is the first study to determine the pattern and magnitude of congenital and developmental cataract at MNH paediatric eye clinic.

In this study 4.8% of the study population was diagnosed to have congenital and developmental cataract and there were more males than females. This findings though they were not statistically significant somehow it compares with other studies that reported males to be more than females. A study done in Tanzania found males to be two times more than females [9]. While in India a study done on aetiologies of childhood cataract found male to female ratio of 3:2 [32]. Another study on epidemiology based etiological study on paediatric cataract found male to female ratio of 2:1 [22, 33].

Most of these studies claim that this could be due to higher social expectations on boys than girls by the parents or society [9, 32]. The other factor is that males are more affected by trauma than girls [22, 33]. This could be true, but some studies show high proportions of males in non traumatic cataract which shows that male sex always dominate female sex in paediatric cataracts independent of its cause [34].

Visual acuity assessment of 116 eyes of 58 patients was done by different methods according to the patient's age. Results from this hospital based study found prevalence of blindness among patients with cataract to be 47.5%, this seem to be very high in comparison to other studies [30, 32]. Studies done in West Africa, Chile and South India in 1993 found prevalence of cataract to be 15.5% among the causes of blindness in West Africa,7.4% in south India and 9,2% in Chile [32]. In Bangladesh a nation wide study done on 750 000 children found one out of three blind children was due to congenital and developmental cataract [30]. This can be explained by the fact that these studies were population based studies and prevalence of cataract was among causes of blindness while the current study was done at the tertiary hospital where all cataract patients are expected to be referred for further management, hence this could be an explanation of getting high prevalence of blindness in our study. Similar

findings were reported on a study on pediatric cataract and surgery outcome in central India [34]. The results of blindness due to cataract 38% were just as high as in this study.

Among the children who were found to be blind, more than half of the eyes with blindness were of children under 24 months of age. These results were statistically significant, this suggest that blindness due to cataract is more common below 24 months of age (p. value 0.001). This can be explained by the fact that most of these children were affected by total cataract. This is an indicator for vision 2020 prevention of childhood blindness that efforts are needed to focus on this treatable cause of childhood blindness.

A study done in India reported 34% of the patients with cataract had congenital cataract among the age group below 5years of age and 64% were above 5yrs of age [63]. The findings of this study compares with results in this current study where all children bellow 24 months of age 34.5% had congenital cataract while children above 24 months of age 65.5% had developmental cataract. However the large differences in age groups make it difficult to compare these two studies. The study from India included children up to 18 years of age while in this study the study population was from 0 months to 192months of age.

The majority of patients with poor vision were above 61 months of age. This is possible because children in this age group can easily communicate with their parents earlier if they cannot see well in comparison with younger children. Leukocoria was found to be more common among patients below 24 months of age. This could be due to the fact that children at this age can not express themselves that they cannot see well until when their parents notice the white pupilary reflex in their eyes.

This study show that bilateral cataract is the common presentation found in children with congenital and developmental cataract though the study was not statistically significant. Bilateral cataract has been reported by other studies as the most common presentation in non-traumatic paediatric cataract. A study done in U.K. reported 66% of cataract to be bilateral and of these 61% was not associated with any other systemic diseases [10]. In this study 54.5% of

bilateral cataracts were not associated with other systemic conditions which also support these findings. Most of the studies reported bilateral cataract to be two third to four times more than unilateral cataract [13, 18, 22, 23 31, 35]. The same findings were also found in this study showing bilateral cataract was three times more than unilateral cataract.

Children who were found to have positive rubella and toxoplasmosis had bilateral cataract. However the findings in this study were not statistically significant. A study done in India on ocular manifestation of CRS found bilateral cataract in 89% of the patients [13]. The findings in this study are almost the same as of this study because 80% of the patients with positive rubella antibodies had bilateral cataract although our study differs from the one done in India because this study was done among all children with non-traumatic cataract and the study in India was conducted among children with CRS which makes it difficult to compare these two studies.

Majority of total cataracts were bilateral though not statistically significant. Similar findings were also reported by other literatures [3, 4, 8,] indicating that total cataract may develop from birth or from other morphological pattern like lamellar or nuclear cataract [8]. However the origin of this cataract in our study could not be identified as these patients had already developed this type of morphology at the time they attended the eye clinic. The presence of total cataract in children below 24 months of age confirms that this type of cataract can also be seen from birth.

Lamellar cataract was more seen among the age group above 61 months of age though the statistical findings were not significant. This late presentation could be due to the fact that lamellar cataract is known to affect vision less. The cataract presentation could have started earlier but as it does not affect vision early, patient delay to seek help until when the cataract is denser. Some studies report lamellar cataract to be inherited or due to infections [4]. In this study we could not determine the role of inheritance in this morphological type. However lamellar cataract was found to be more frequent among patients with negative blood results (58.9%). One sixth of patients with lamellar cataract had positive rubella antibodies and two

third were positive to toxoplasmosis and rubella antibodies. This finding is also supported by other studies, that lamellar cataract may results from infections [3, 4, 8, 15].

In this study three patients presented with congenital heart disease, two patients were found to be deaf and other two had history of epilepsy. All these seven children their blood results were positive for rubella and toxoplasmosis. Though the findings in this study were not statistically significant most studies report rubella infection in the first trimester of pregnancy to be associated with severe systemic anomalies like congenital heart disease, loss of hearing and CNS anomalies and cataract [13, 23, 27, 29].

In this study toxoplasmosis was found to be more associated with rubella in 8 (13.8%) patients while 1 (1.7%) patient had toxoplasmosis alone. The findings in this study are almost similar to other studies. The prevalence of cataract among toxoplasmosis patients in Chicago was almost the same as in this study 11.6% [25]. A study done in Brazil among patients with toxoplasmosis found 6 (13.6%) patients with cataract [31].

In more than half of this study population the causes of cataract could not be determined (56.9%). However a study done in northern India on morphological patterns and etiology of congenital cataract reported idiopathic cataract to be the most common cause of congenital cataract occurring in 46% of cases [19]. Another study done in India found 51% of cataract to be undetermined [23]. The findings in these two studies are comparable with this study though the statistical findings were not significant.

CONCLUSION AND RECOMMENDATION

Conclusion

1. The findings from this study found that rubella and toxoplasmosis are still important causes of congenital and developmental. This is of great concern in the prevention of these infections. These findings also highlight the effort of vision 2020 to focus on these infections in developing countries like Tanzania.

2. The results from this study also highlight that childhood cataract is an important cause of childhood blindness.

Recommendations

1. To include an ocular examination during immunization programmes for early detection of cataract in children and immediate referral to paediatric ophthalmologists in order to prevent childhood blindness due to cataract.

2. This was a baseline hospital based study. More studies have to be conducted to determine the national prevalence of congenital and developmental cataract as well as its aetiologies in Tanzania.

3. Recommend to the MOHSW the importance of rubella vaccine in all women at their reproductive age to prevent maternal rubella cataract in their off spring.

Study limitations

The detection of other infectious causes like herpes simplex virus and cytomegalovirus could not be done due to lack of laboratory reagents.

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