

Spectrum and burden of ophthalmic disease
at Rob Ferreira Hospital, Mpumalanga

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**DECLARATION
DEPARTMENT OF NEUROSCIENCES**

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PRESENTATIONS

Ophthalmology Society of South Africa (OSSA)

The Boardwalk Hotel, Port Elizabeth.

South Africa March 2017

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Awarded second place in the registrar competition.

ABSTRACT

Purpose: The burden of eye disease in rural areas in South Africa has not been well documented. Mpumalanga is one of the rural provinces in South Africa, accounting for 7,8% of the population of the country. There are studies in South Africa that focus on particular ophthalmic diseases (e.g. cataract, glaucoma) or particular aspects of eye diseases (e.g. vision-threatening) but none thus far have provided a glimpse into the full spectrum of disease. Rob Ferreira Hospital is one of three public hospitals in Mpumalanga that provide ophthalmology services. In order to optimise care offered to this rural community, the spectrum and burden of disease needs to be understood. The purpose of this study was to assess, firstly, the burden of patients with ophthalmic disease who present to the Rob Ferreira Hospital and secondly, to identify deficiencies in the system with regard to the availability of staff, as well as the diagnostic and interventional equipment available to treat these patients.

Method and materials: A retrospective, cross-sectional, descriptive study of all patients attending the Rob Ferreira ophthalmology outpatient clinic between 1 January 2012 and 31 December 2012 was conducted. Patient files were accessed to retrieve the following information: age, sex, race, comorbidities and diagnosis or diagnoses. An audit of staff as well as diagnostic and interventional equipment available at the clinic was conducted during the same time period.

Results: There were 2493 patients seen between January and December 2012 at the Rob Ferreira ophthalmology outpatient clinic. Of the 2493 patient files that were searched for, 2142 were found, representing a capture rate of 85.9%. The majority of patients seen at the eye department were black African (89,3%), followed by Whites (9,1%), Indians (0,89%) and Coloureds (0,61%). Male patients made up 53.2% of the patients seen. The mean age of patients was 45,69 years. Cataracts, ocular trauma, glaucoma and diabetic retinopathy were the most

common eye problems seen at the hospital. Twenty five percent of patients who presented with cataracts had mature cataracts. Twenty percent of patients diagnosed with glaucoma were classified as advanced or end-stage disease. Ocular trauma was diagnosed in 317 patients presenting to the eye clinic.

There is only 1 ophthalmologist to serve a minimum of 1,7 million people which is well below the norm for the country as well as internationally. There is also a shortage of essential equipment crucial for the correct diagnosis and management of ophthalmic patients.

Conclusion: This retrospective audit provides some insights into the burden of disease at a tertiary hospital in one of the rural provinces in South Africa. Cataracts, ocular trauma, glaucoma and diabetic retinopathy were the most common eye problems seen at the hospital. A large proportion of patients present with advanced eye disease to the hospital. There is a shortage of staff and lack of equipment that would enable adequate running of the department. Certain essential services such as vitreoretinal surgery are not offered by the hospital due to the shortage of crucial diagnostic and interventional equipment.

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TABLE OF CONTENTS

CHAPTER 1	1
1.1 Background to the Study	1
1.2 Literature review	2
1.2.1 Ophthalmic diseases.....	2
1.2.2 Staff and Equipment	10
2.....	12
2.1 Research aim	12
2.2 Research objectives	12
2.2.1 Primary Objectives.....	12
2.2.2 Secondary Objectives.....	12
CHAPTER 3	13
CHAPTER 4	15
4.1 Demographic profile	15
4.2 Co-Morbidities	17
4.3 Ophthalmic diseases.....	18
4.3.1 Cataracts.....	19
4.3.2 Glaucoma	19
4.3.3 Ocular Trauma	20
4.3.4 Diabetic Retinopathy	21
4.3.5 Vitreoretinal disease (Other than DR)	22
4.3.6 Conjunctival disease	24
4.3.7 Corneal disease	26
4.3.8 Uveitis	28
4.3.9 Neuro-ophthalmic disease.....	29
4.3.10 Other	31
4.4 Staff and equipment	32
CHAPTER 5	34
CHAPTER 6	44
6.1 Short-term.....	44

6.2 Long-term.....	45
REFERENCES	46
APPENDICES	50
Appendix A	50
Appendix B	51
Appendix C	52
Appendix D	53
Appendix E.....	54

LIST OF FIGURES

Fig 4.1: Number of patients attending Rob Ferreira Hospital eye department according to sex

Fig 4.2: Age distributions of patients attending Rob Ferreira Hospital eye department

Fig 4.3: Racial distribution of patients

Fig 4.4: Distribution of the most common ophthalmic problems according to sex

Fig 4.5: Age distributions of cataract patients

Fig. 4.6: Subtypes of glaucoma in patients

Fig 4.7: Age distributions of patients with diabetes mellitus

Fig 4.8: Types of vitreo-retinal disease amongst patients attending Rob Ferreira Hospital eye department

Fig 4.9: Types of conjunctival diseases amongst patients attending Rob Ferreira Hospital eye department

Fig 4.10: Histology of patients with conjunctival masses

Fig 4.11: Types of corneal diseases in patients attending Rob Ferreira Hospital eye department

Fig 4.12: Age distributions of patients with Uveitis

Fig 4.13: Neuro-ophthalmic diseases

Fig 4.14: Causes of optic atrophy

Fig 4.15: Other ophthalmic conditions in patients attending Rob Ferreira Hospital department

LIST OF TABLES

Table 4.1: Co-morbidities amongst patients according to age

Table 4.2: Co-morbidities amongst patients according to sex and race

Table 4.3: Mean age of patients with cataracts, glaucoma and trauma

Table 4.4: Classification of diabetic retinopathy in patients attending Rob Ferreira Hospital eye department

Table 4.5: Aetiology of keratitis amongst patients attending Rob Ferreira Hospital eye department

Table 4.6: Classification of uveitis according to anatomical location

CHAPTER 1

LITERATURE REVIEW

1.1 Background to the Study

The burden of eye disease in rural areas in South Africa is not well documented. There are studies in South Africa that focus on particular ophthalmic diseases (e.g. cataract, glaucoma) or particular aspects of eye diseases (e.g. vision-threatening) but none that has provided a glimpse into the full spectrum of disease. Many ophthalmology patients are seen in rural areas but the prevalence of ophthalmic diseases is not known. This consequently creates difficulty for any health promotion interventions, screening programmes and for the procurement of equipment since the magnitude of the problem is not quantified. Areas that are in dire need of health services are therefore not effectively identified, leading to a lack of service delivery.

Rob Ferreira hospital is in Nelspruit, Mpumalanga, which is part of the Mbombela South sub district. It is one of three hospitals in Mpumalanga that provides ophthalmology services and this is where the study was conducted. There are 2 outpatient clinics and 2 theatre days per week for operations. It serves as a tertiary hospital in the province and is the final level of care for many ophthalmology patients. It currently serves the Ehlanzeni district (which includes the Mbombela south sub-district) and beyond, with patients seen from as far afield as Limpopo province and neighbouring Zimbabwe, Mozambique and Swaziland. The Ehlanzeni district comprises 5 local municipalities namely, Mbombela, Thaba Chweu, Nkomazi, Umjindi and Bushbuckridge.

The population in Mpumalanga in the 2011 census was 4 039 939, having increased from 3 365 554 in 2001. This represented a 20,0% increase in the province's population since 2001.

The population of the province comprises 7,8% of the country's total population, having increased from 7,5% in 2001. The percentage distribution of the province's population according to race was 90,9% Black African, 7,5% White, 0,9% Coloured and 0,7% Indian or Asian. The population of the Ehlanzeni district is 1 688 615 people. The population of the Mbombela municipality was 588 794 in 2011, making up 14,6% of the province's population. The percentage distribution of the Mbombela sub district's population according to race was 89,6% Black African, 8,8% White, 1,0% Coloured and 0,7% Indian or Asian. ¹

The purpose of this study was to assess, firstly, the burden of patients attending the ophthalmology department at Rob Ferreira Hospital and secondly, to identify deficiencies in the system with regard to staff and equipment resource needs for the adequate medical and surgical management of patients. All the major ophthalmic diseases were analysed. The results can potentially be used by hospital management to optimise the allocation of essential ophthalmic equipment and the allocation of adequately qualified staff.

1.2 Literature review

1.2.1 Ophthalmic diseases

The spectrum of eye disease is extensive; its prevalence varies from country to country and between the developed and developing countries of the world. Studies regarding the prevalence of ophthalmic diseases can also be divided into community-based and hospital-based studies. By 2020, it is estimated that approximately 76 million people worldwide will be blind, 80% of whom will live in the developing world.² Resnikoff *et al.* found that more women are blind around the world than men with the male to female ratio of patients with blindness ranging from 1:1,5 to 1:2,2.³ This was attributed to the increased longevity of women when compared to men. This study also found that 82% of patients with blindness were over the age of 50 years.

1.2.1.1 Cataracts

According to Resnikoff *et al.*, cataracts are the leading cause of blindness in the world, followed by glaucoma and then age-related macular degeneration.³ Cataracts account for as much as 48.7% (17.7 million people) of all forms of blindness worldwide. The proportion of blindness and visual impairment due to cataracts varies among developing countries around the world. In developing countries, it is highest for India (82.6%); moderate for Nepal (48.1%), Africa (37.8%-59%), the rural areas of Latin America (28.3%-30%) and China (39.6%-64%); and lowest in urban areas of Latin America (0.5%).⁴ This review by Rao *et al* further stated that men are more likely to receive cataract surgery than women due to several reasons such as lack of funds resulting in poor access to services by women, the need for an accompanying person, needing permission to travel etc.⁴ The overall prevalence of cataract in the adult population of Europe in 2007 was 19%, with 64% of patients diagnosed with cataract being over 70 years of age.⁵ A systematic review on the causes of visual impairment published in 2004 showed that cataract prevalence in the United States of America varies among the various ethnic groups. It is 8.7% in the White population, 14.8% in the Hispanic population and 36.8% in the African American population.⁶ The authors proposed a poorer access to eye care and poor health seeking behaviour among black patients when compared with their White counterparts.

Not many studies have documented the impact of cataract blindness in Africa. A population-based study conducted in Ghana from 2006-2008 by Budenz *et al.*, showed that cataract accounted for 53.4% of visual impairment (Best corrected visual acuity [BCVA] <20/40 but >20/400) and 44,2% of blindness (BCVA <20/400 in the better seeing eye).⁷ The earliest published data on the prevalence of cataract blindness in the general population in rural Kwa-Zulu Natal was 0.59% in both 1990 (n=6090) and 1993 (n=6192) respectively.⁸ Comparatively, a study with 2750 participants conducted in Cape Town by Cockburn *et al* in 2010, showed

that cataract accounted for 27% of blindness (Visual Acuity [VA] <3/60). It also showed that the prevalence of severe visual impairment (VA<6/60-3/60) was 37% and visual impairment (VA 6/18-6/60) was 27%.⁹

1.2.1.2 Glaucoma

Glaucoma, if left untreated, is the leading cause of irreversible blindness worldwide and the second most common cause of blindness after cataracts.¹⁰ In 2006, Quigley *et al.*, calculated the total prevalence of all types of glaucoma worldwide, based on age- and sex-specific projections.¹¹ They projected the prevalence to be 60,5 million in 2010 and to increase to 79,6 million in 2020. This would give a global prevalence of 2.65% in 2010 increasing to 2.86% in 2020. The highest absolute number of patients with glaucoma is in China (15.8 million in 2010), followed by Europe and India whilst the highest prevalence of glaucoma is in Africa (4.32% in 2010), followed by Japan and Latin America.¹¹ Open-angle glaucoma (OAG) was the predominant subtype comprising 73.8% of all glaucoma whilst angle closure glaucoma (ACG) comprised 25.9%. The greatest number of patients with angle closure glaucoma in 2010 were in China (47.5% of all patients with ACG), and 86.5% of those affected by angle closure glaucoma were in Asia.¹¹ The authors did not propose a reason for these prevalences.

A study of 6090 participants by Cook *et al.* conducted in Kwa-Zulu Natal in 1990, found that 1% of the population were blind, with glaucoma accounting for 36% of the blindness.¹² The age- and sex-adjusted prevalence of glaucoma in another study in Kwa-Zulu Natal (n=1005) by Rotchford *et al.* in 1999 was 4.5%, comprising 22.9% of all blindness.¹³ This is in line with the average prevalence for Africa. Of the 4,5% of patients with glaucoma, 2.7% was primary open angle glaucoma (POAG); making it the most frequently encountered subtype.¹³ They also found the prevalence of secondary glaucoma accounted for 1.7%. Pseudoexfoliative glaucoma

accounted for more than 50% of the secondary glaucoma cases (11 out of 21 patients). The prevalence of angle closure glaucoma was 0.5% with only one patient out of fifty-one patients with primary angle closure glaucoma.¹³ The prevalence of primary and secondary glaucoma increased dramatically with age, with 78.4% of all glaucoma occurring in patients aged 60 years or older. The prevalence of POAG increased exponentially from 1.2% to 7.7% from the fifth to ninth decades of life.¹³ Cockburn *et al.* found that glaucoma accounted for 11%, 6% and 7% of blindness, severe visual impairment and visual impairment respectively.⁹ In South Africa the prevalence of pseudo-exfoliative glaucoma, as a cause of secondary OAG in Hlabisa (Northern Kwa-Zulu Natal in 1999) and Temba (North West province in 1998) was 24,3% (9 out of 37 patients) and 23,1% (9 out of 39 patients) respectively.¹⁴

1.2.1.3 Age-related macular degeneration

In the USA, age-related macular degeneration (AMD) is the leading cause of blindness amongst the White population.⁶ It accounted for 54.4% of blindness in this population group whilst it accounted for only 14.3% of blindness amongst Hispanic patient and 4.4% amongst African American populations.⁶ In the United Kingdom, the prevalence of late AMD was found to be 2.4% in those aged over 50; and 4.8% and 12.2% in those aged 65 or more and 80 or more respectively.¹⁵ The prevalence rates of geographic atrophy were 1.3% for those aged over 50, 2.6% for those aged over 65 and 6.7% for those aged over 80. Neovascular AMD had a reported prevalence of 1.2% (>50 years of age), 2.5% (> 65 years of age) and 6.3% (>80 years of age).¹⁵

In South Africa, Cockburn *et al* reported AMD prevalence to be much lower, accounting for 11% of blindness, 7% of severe visual impairment and 2% of visual impairment.⁹ This is

similar to China in which the proportion of blindness caused by AMD was 10% in 2001-2003 increasing to 11.6% in 2007-2009.¹⁶

1.2.1.4 Ocular trauma

Trauma is another major burden of disease in South Africa. A review of 28 340 patient records from 2003-2007 in the USA, showed that the annual prevalence of eye injuries in trauma patients ranges between 1,97%- 6%.¹⁷ Young White males accounted for most patients with ocular trauma in this study. The mean age of patients with ocular trauma was 37,2-39,1 years, with males accounting for 70.2% to 72.6% of patients with ocular injury.¹⁷ The most common types of ocular injury were closed orbital fractures accounting for 0.59% to 2.37% and contusions which accounted for 0.95% to 2.48% of all trauma patients. Globe lacerations only accounted for 0.14% to 0.31% of all trauma admissions.¹⁷ A study conducted on perforating eye injuries in Kwa-Zulu Natal by Cook in 1991, showed 87% of patients with perforating ocular trauma were male. The mean age of patients with ocular trauma was 27,2 years.¹⁸

1.2.1.5 Refractive error

One of the common causes of visual impairment is an uncorrected refractive error, particularly presbyopia in older individuals. A multi-centre population-based study (n=17 734) by He *et al.* involving seven sites in six countries (USA, China, India, Nepal, Niger and Durban, South Africa), showed that near vision impairment in general shows a prevalence of 50% from age 40-49 and increases with increasing age.¹⁹ These populations were urban (2 sites: USA and China), rural (4 sites: 2 in India and 1 each in Nepal and Niger) and semi-urban (Durban). It showed that the populations in Durban and India had an earlier onset of near vision impairment at 35 years of age which was the minimum age for entry into the study.¹⁹ The age- and sex-adjusted prevalence of near vision impairment for Durban and India was 83%. Cockburn *et al*

reported that refractive error accounted for 0% of blindness, 22% of severe visual impairment and 50% of visual impairment in Cape Town.⁹

1.2.1.6 Diabetic retinopathy

Diabetic retinopathy (DR) is the most common cause of blindness among income-generating adults around the world.²⁰ A systematic review by Yau *et al.* conducted in 2010, showed that overall age-standardised prevalence of DR in diabetics worldwide was found to be 34.6%; with the prevalence of proliferative diabetic retinopathy (PDR), diabetic macular oedema (DMO) and vision-threatening diabetic retinopathy being 6.96%, 6.81% and 10.2% respectively.²¹ A meta-analysis of population-based studies in China by Liu *et al.*, showed that the prevalence of any DR was 1.3%, non-proliferative DR was 1.1%, and proliferative DR was 0.1%.²² These prevalence figures increased in the diabetic population to 23% for patients with any DR, 19.1% for patients with non-proliferative DR, and 2.8% for patients with proliferative DR. The prevalence of diabetic retinopathy in a population of 5999 diabetic patients in Chennai, India, was 18.0% compared with a prevalence of diabetic retinopathy in the general population of only 3.5%.²³

A study conducted by Carmichael *et al* in 2005 found that the prevalence of any form of DR among 1595 diabetic patients attending the diabetic clinic at an academic hospital in Johannesburg, was 26.5%.²⁴ Severe retinopathy was found in 11.7% of patients. Another study conducted Read and Cook on 248 diabetic patients at a primary health care centre in Cape Town in 2005, showed that the prevalence of DR among Type 2 diabetics was 32.3%, with 8.9% having sight-threatening retinopathy.²⁵ Diabetic Retinopathy caused 8%, 11% and 2% of blindness, severe visual impairment and visual impairment respectively, in Cape Town.⁹

1.2.1.7 HIV-associated ophthalmic disease

The prevalence of Human Immunodeficiency Virus (HIV)-associated ophthalmic disease, as well as the specific subtypes of the associated diseases, is highly variable among countries. A study conducted in 2006 by Pathai *et al.* that compared the prevalence of HIV-associated ophthalmic disease in Cape Town South Africa, and Mumbai India, showed that the overall prevalence was 12.1% in Cape Town and 17.5% in Mumbai.²⁶ Ten years ago, the overall prevalence of retinal opportunistic infections in Cape Town was only 2.6%, when compared to Mumbai with a prevalence of 11.4%. These retinal opportunistic infections comprised of cytomegalovirus (CMV) retinitis which had a prevalence of 1,3% in Cape Town and 8,7% in Mumbai.²⁶ This was in contrast to ocular tuberculosis (TB) and toxoplasmosis which had a combined prevalence of 1.3% and 2,7% in Cape Town and Mumbai respectively.²⁶ Optic neuropathy occurred with a prevalence of 3.8% in Cape Town and 2.0% in Mumbai, whilst HIV retinopathy occurred in 5.1% of patients in Cape Town and 4.7% of patients in Mumbai. Interestingly, a study conducted in Turkey in 2011 showed a higher prevalence (8.6%) of HIV retinopathy, but no patients in the study were affected by CMV Retinitis.²⁷ Shi *et al* showed in 2007, that the prevalence of CMV retinitis amongst 303 hospitalised AIDS patients in Shanghai, China was 7.6%.²⁸ A hospital-based study in India showed that the prevalence of HIV retinopathy and cytomegalovirus (CMV) retinitis was 12% and 7% respectively.²⁹ A hospital-based prevalence study conducted in Nigeria in 2008 showed that vitreo-retinal diseases accounted for 3,9% of all new patients attending the eye clinic.³⁰ DR, Hypertensive retinopathy and AMD accounted for most of the presentations to the hospital. Retinal detachment only accounted for 5,8% of patients who presented to the hospital.³⁰

1.2.1.8 Uveitis

Uveitis, though not as common as cataract or glaucoma, is a potentially sight-threatening condition seen in the ophthalmology outpatients department. A study conducted in Scotland in 2005 yielded a population based prevalence of uveitis of 25 per 100,000 persons.³¹ In comparison, the population-based prevalence of uveitis in Taiwan increased from 318.8 cases per 100,000 persons in 2003 to 622.7 cases per 100,000 persons in 2008.³² The only article pertaining to uveitis in South Africa was a hospital-based study performed in the 1970's. The study conducted by Freedman indicated that the incidence of all types of uveitis in the African population in Johannesburg, was 25 per 100,000 individuals per year.³³

1.2.1.9 Conjunctival conditions

Conjunctival conditions are also commonly seen in the outpatient department. The overall prevalence of pterygia in a study conducted between 2004 and 2007 in Singapore in Asian people of multiple ethnicities was 10.1%.³⁴ This study showed that people of Malay origin were at more risk of developing pterygia than people of Chinese and Indian origin, suggesting a possible genetic cause for its development.³⁴ A study in Chennai, India conducted between 2001 and 2004, showed that the prevalence of pterygia in patients over 40 years of age was 9.5% and that it differed significantly between the urban (3.7%) and the rural populations (15.2%).³⁵ Pterygia prevalence in the same age group of patients in Spain was lower at 5.9% with males showing a prevalence of 4.8% and females showing a prevalence of 6.5%.³⁶ A multi-centre population-based study in China showed that the overall prevalence of pterygium was 11.95% with 4.27% of patients having bilateral disease and 7.56% of patients having unilateral disease.³⁷ In Nigeria, the population-based prevalence of pterygia was found to be 19,3%.³⁸

The hospital-based prevalence of conjunctival squamous cell carcinoma in HIV-positive patients in Kenya was shown to be 7.8%.³⁹

In a study from Japan conducted in 2005, the prevalence of allergic rhinoconjunctivitis increased from age 6 to 10 years, and reaching a peak prevalence of 34,8% at the age of 10 years.⁴⁰ Allergic conjunctivitis was prevalent in 19.2% of children aged 5-19 years in Karachi, Pakistan.⁴¹ The prevalence of allergic conjunctivitis amongst school-going children in Ghana was 39.9%; 56.7% of patients were female whilst 43.3% were male.⁴²

1.2.2 Staff and Equipment

An International Council of Ophthalmology (ICO) survey conducted in 2010 revealed that there were 204 909 ophthalmologists worldwide.⁴³ There was, however, a large variation in the number of ophthalmologists per country with half the number of ophthalmologists worldwide found in China, USA, Russia, Japan, Brazil and India. Sub-Saharan Africa showed the lowest number of ophthalmologists (2,7 per million) whilst former socialist countries showed the highest number of ophthalmologists (88,3 per million).⁴⁴ South Africa had 7 ophthalmologists per million population in 2010, although no distinction was made between ophthalmologists in private and public service. This decreased to 6 ophthalmologists per million people in 2012.⁴⁴ This is in contrast to developed countries such as the USA which has 58 ophthalmologists per million population and England which has 49 ophthalmologists per million population.⁴⁴

No studies or documents relating to the standard diagnostic and interventional equipment that an ophthalmology outpatient department should possess were found. The equipment at another tertiary hospital (Charlotte Maxeke Johannesburg Academic Hospital-CMJA) in the country was used as a standard upon which to assess the adequacy of equipment at Rob Ferreira Hospital.

All the studies reviewed above have focused on specific diseases or specific aspects of ophthalmic disease. This study intended to focus on the full spectrum of ophthalmic disease seen at the eye department at Rob Ferreira hospital. Secondly, took it a step further and assess the capability of the ophthalmic services and resources available at Rob Ferreira Hospital in dealing with this disease burden, which to our knowledge has not been done in South Africa before.

RESEARCH AIM AND OBJECTIVES

2.1 Research aim

The aim of the study is to describe the burden of disease at Rob Ferreira Hospital Eye Department in Mpumalanga from 01 January 2012 to 31 December 2012 and to identify any deficiency in the staff, diagnostic and therapeutic equipment available to cope with this disease burden at the hospital.

2.2 Research objectives

2.2.1 Primary Objectives

- To describe the demographic profile (age, sex, and race) of patients who attend the eye department at Rob Ferreira Hospital.
- To describe the ophthalmic disease profile of patients attending the eye department and their existing comorbidities.

2.2.2 Secondary Objectives

- To describe the existing staff and ophthalmic equipment available for service delivery at the eye department at Rob Ferreira Hospital.
- To describe the adequacy/deficiency between the burden of disease and the available staff and ophthalmic equipment.

CHAPTER 3

METHOD AND MATERIALS

3.1 Study design

A retrospective, cross-sectional, descriptive study of all patients attending the Rob Ferreira Ophthalmology department from 1 January 2012 to 31 December 2012 as well as the staff and equipment (both diagnostic and therapeutic) available during this period.

3.2 Method

Study-patient information (Patient data collection sheet: Appendix A) was collected from the files of patients who attended the ophthalmology department at Rob Ferreira Hospital during the period from 1 January 2012 to 31 December 2012. This period was chosen because of the availability of systematic record keeping for this period. The equipment and staff available at the hospital was also collected (Appendix B). The equipment was measured against what is available at Charlotte Maxeke Johannesburg Academic Hospital.

3.3 Study population

This consisted of 2493 patients who were seen from 1 January 2012 to 31 December 2012 at the Rob Ferreira Hospital eye department.

3.4 Patient confidentiality

Each patient's hospital number was assigned a unique code to ensure anonymity. This code appeared on the data collection sheet together with the information obtained from the patients file. The file linking the patients' unique code to the patient hospital number was kept completely separate from the datasheet and was only to be used for crosschecking purposes. Strict confidentiality was maintained at all times. None of the staff in the study were named or identified at all.

3.5 Inclusion criteria

All patients who attended the Rob Ferreira Hospital Ophthalmology department during the study period and whose names were recorded in the eye department register; whether referred from clinics, general practitioners, or other hospitals within the municipality; or other departments within the hospital.

3.6 Exclusion criteria

Patients with no diagnosis or an illegible diagnosis written in the file.

3.7 Materials, equipment and facilities

Medical records of patients attending the ophthalmology department at Rob Ferreira Hospital specifically looking at the relevant information mentioned under methods.

3.8 Data management and statistics

Microsoft Access database was used for data storage and management. Data from Access was exported into Microsoft Excel for the purpose of analysis. Simple descriptive statistics were used to generate means, percentages, and proportions.

3.9 Ethical considerations

Ethical clearance was obtained from the University of the Witwatersrand Human Research Ethics Committee in order to perform research (Appendix C). Protocol approval by the faculty of health sciences was also obtained (Appendix D). Permission from the Chief Executive Officer (CEO) of Rob Ferreira Hospital to review patients' records and extract information from these records was also granted. No names, hospital numbers or any other information that can breach patient confidentiality will be published.

CHAPTER 4

RESULTS

4.1 Demographic profile

There were 2493 patients seen in 2012. Of the 2493 patient files that were searched for, only 2142 were found, representing a capture rate of 85.9%. The sex of the patients attending the outpatient department are represented in figure 4.1.

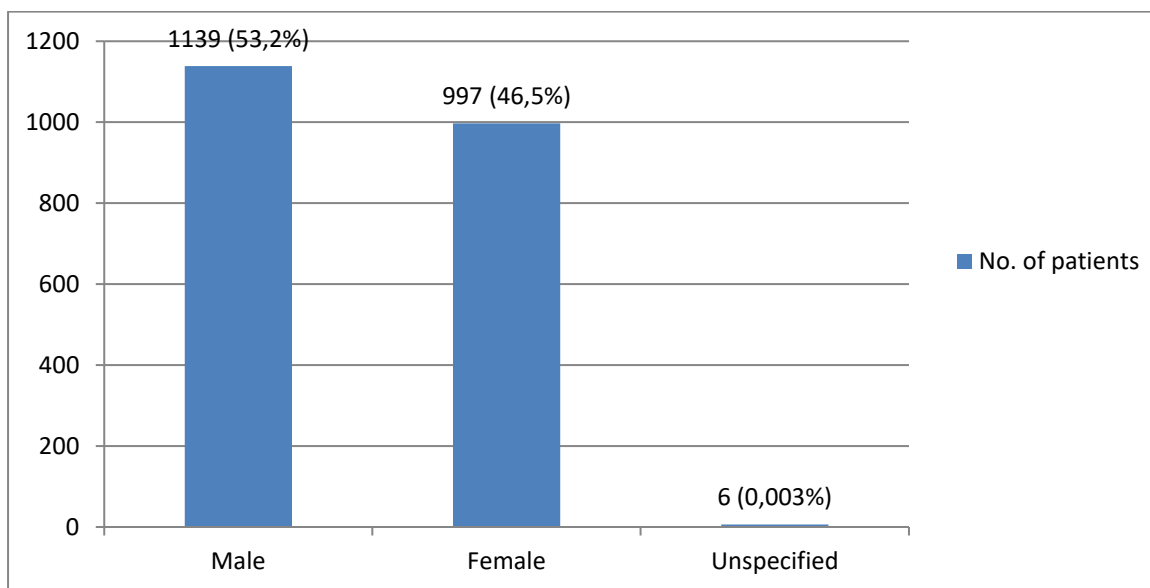


Fig. 4.1 Number of patients attending Rob Ferreira Hospital eye department according to sex

The mean age of patients attending the out-patient department was 45.7 years (range: 1 day-102 years). Two patients had no age recorded in their files. The age distribution of patients is shown in Fig. 4.2 below.

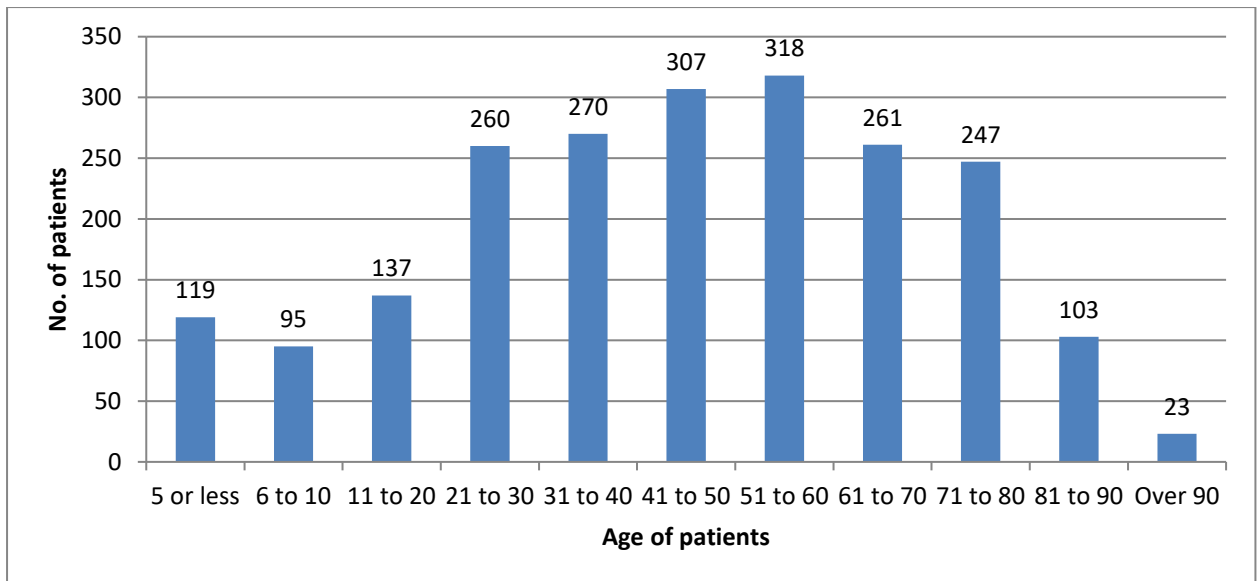


Fig. 4.2 Age distributions of patients attending Rob Ferreira Hospital eye department

Fig 4.3 shows the distribution of patients according to race. Only 1 patient (not shown in fig. 4.3) was Arab (0,05%).

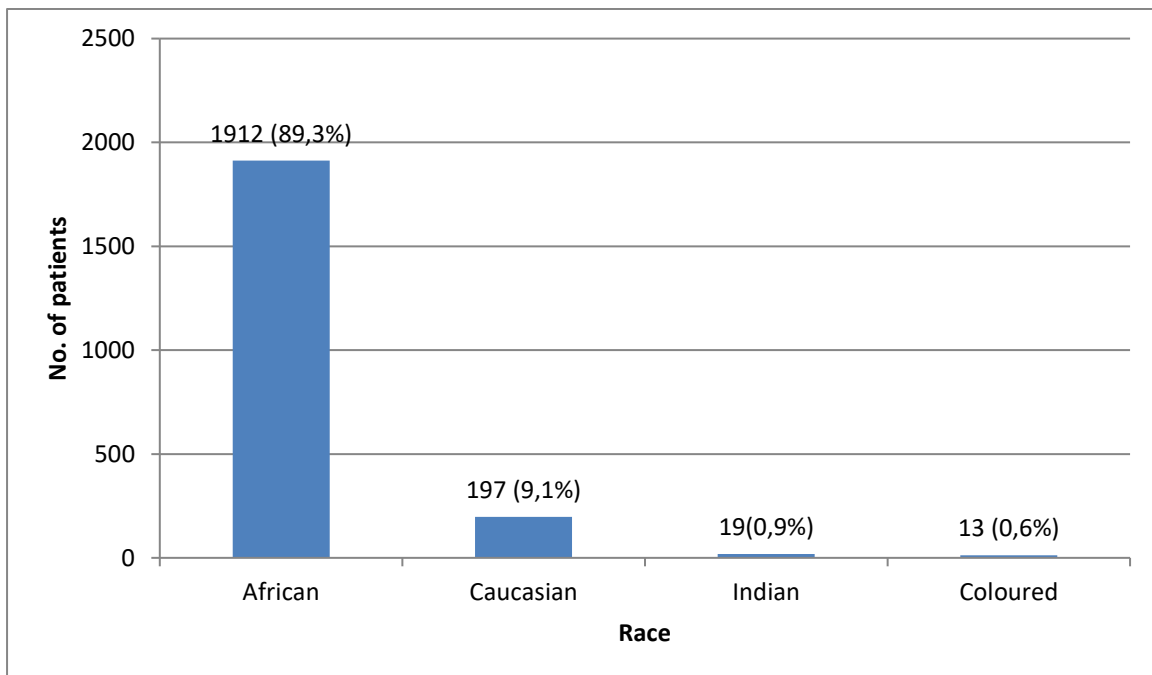


Fig. 4.3 Racial distribution of patients

4.2 Co-Morbidities

Table 4.1 and 4.2 show the distribution of co-morbidities according to age, sex and race. Of the 187 patients that were HIV positive, 115 (61.5%) of those had CD4 counts recorded in their files. The mean CD4 count was $332.1 \times 10^6/l$ with the minimum being $2 \times 10^6/l$ and the maximum being $1508 \times 10^6/l$. Seventy-five (65.2%) patients had CD4 counts $\leq 350 \times 10^6/l$.

Table 4.1: Co-morbidities amongst patients according to age and sex

<u>Co-morbidity</u>	<u>Mean age for males (yrs.)</u>	<u>Mean age for females (yrs.)</u>	<u>Mean age (yrs.) Total</u>	<u>Male n= (%)</u>	<u>Female n= (%)</u>	<u>Total n= (%)</u>
Diabetes Mellitus	59,9	60,2	60,1	125 (43,6%).	162 (56,4%)	287 (13.4%)
Hypertension	63,5	64,7	64,2	171 (40,2%)	244 (57,4%)	415 (19.4%)
HIV	41,0	41,1	41,1	75 (40,1%)	112 (59,9%)	187 (8.7%),

Table 4.2: Co-morbidities amongst patients according to race

<u>Co-morbidity</u>	<u>African n (%)</u>	<u>White n (%)</u>	<u>Indian n (%)</u>	<u>Coloured n (%)</u>	<u>Total n (%)</u>
<u>Diabetes Mellitus</u>	246(85,7%)	29 (10,1%)	7(2,4%)	5(1,7%)	287(13.4%)
<u>Hypertension</u>	343(80,7%)	69 (16,2%)	8(1,9%)	5 (1,2%)	425(19.8%)
<u>HIV</u>	184(98,4%)	(0,01%)	0 (0%)	1(0,005%)	187 (8.7%),

4.3 Ophthalmic diseases

The most frequent ophthalmic problems seen at the Rob Ferreira hospital eye department were cataracts, glaucoma and ocular trauma. The burden of these ophthalmic problems according to age and sex is summarised in figure 4.4 and table 4.3 below.

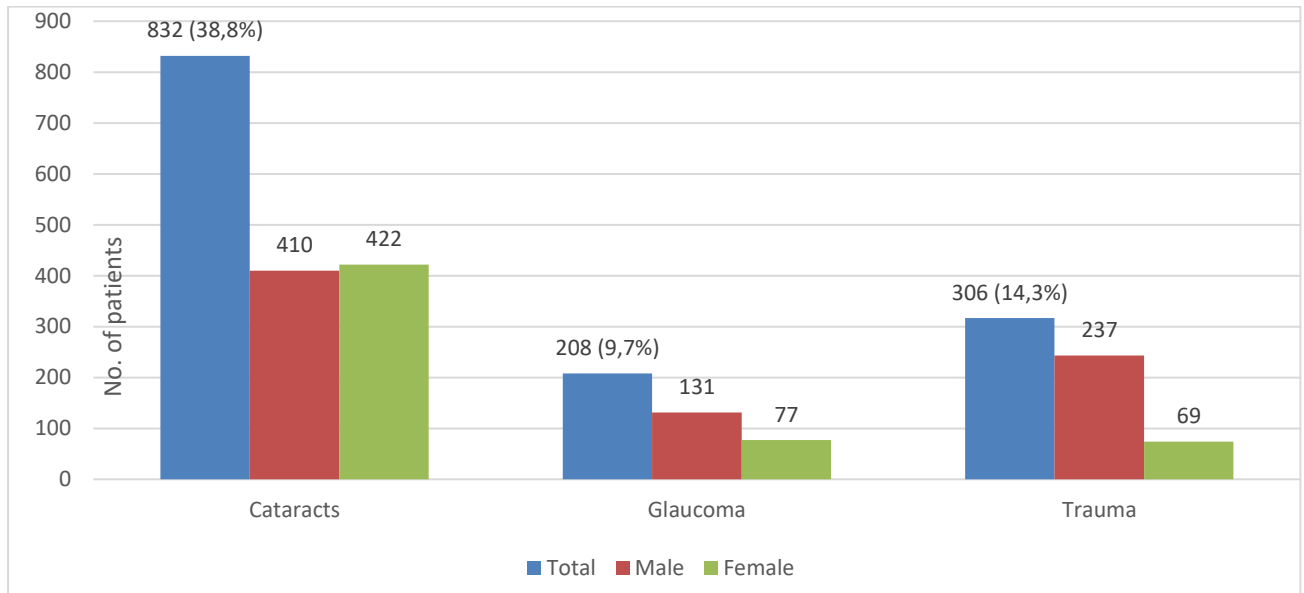


Fig. 4.4 Distribution of the most common ophthalmic problems according to sex

Table 4.3 Mean age of patients attending Rob with cataracts, glaucoma and trauma

<u>Ophthalmic disease</u>	<u>Mean age (yrs.)</u>	<u>Mean age of males</u> <u>(yrs.)</u>	<u>Mean age of</u> <u>females (yrs.)</u>
<u>Cataract</u>	60,0	57,7	62,4
<u>Glaucoma</u>	62,2	60,6	64,7
<u>Trauma</u>	31,5	31,6	31,3

4.3.1 Cataracts

There was a total of 832 patients diagnosed with cataract. Five hundred patients (60.0%) had bilateral cataracts and 332 (40%) had unilateral cataracts, giving a total of 1332 eyes with a cataract. Of the eyes diagnosed with cataract, 365 (27.4%) were diagnosed with mature cataracts, 504 (37.8%) were incipient and 463 (34.8%) were unspecified. Fig. 4.5 below shows the age distribution of patients with cataracts.

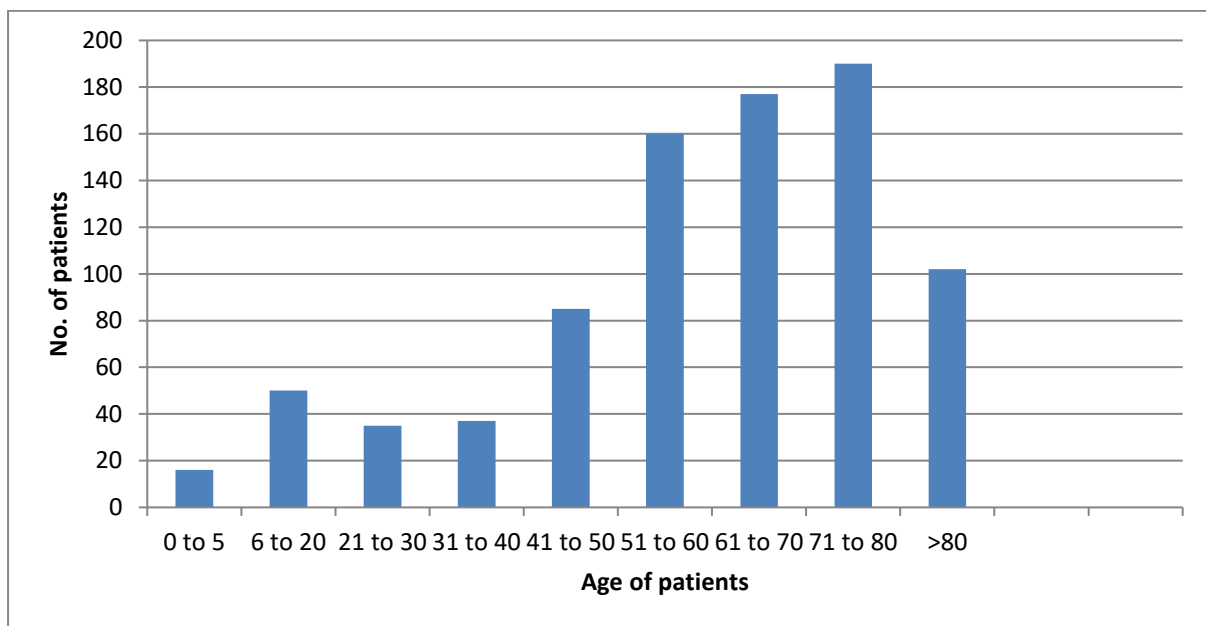


Fig 4.5 Age distributions of cataract patients

4.3.2 Glaucoma

A total of 208 patients with glaucoma were seen. Unilateral disease was present in 20 (9.6%) patients whilst 188 (90.4%) patients had bilateral disease. The subtypes of glaucoma are shown in figure 4.6 below. Of the patients with unilateral disease, 15 (75%) had secondary forms of glaucoma with 10 (66.6%) of the unilateral secondary glaucoma being neovascular glaucoma. Out of all the glaucoma patients, 43 (20.1%) patients were labelled as end-stage or advanced. Of these, 40 (93%) patients were primary open angle, 2 (4.7%) patients were pseudoexfoliative and 1 (2.3%) was unspecified.

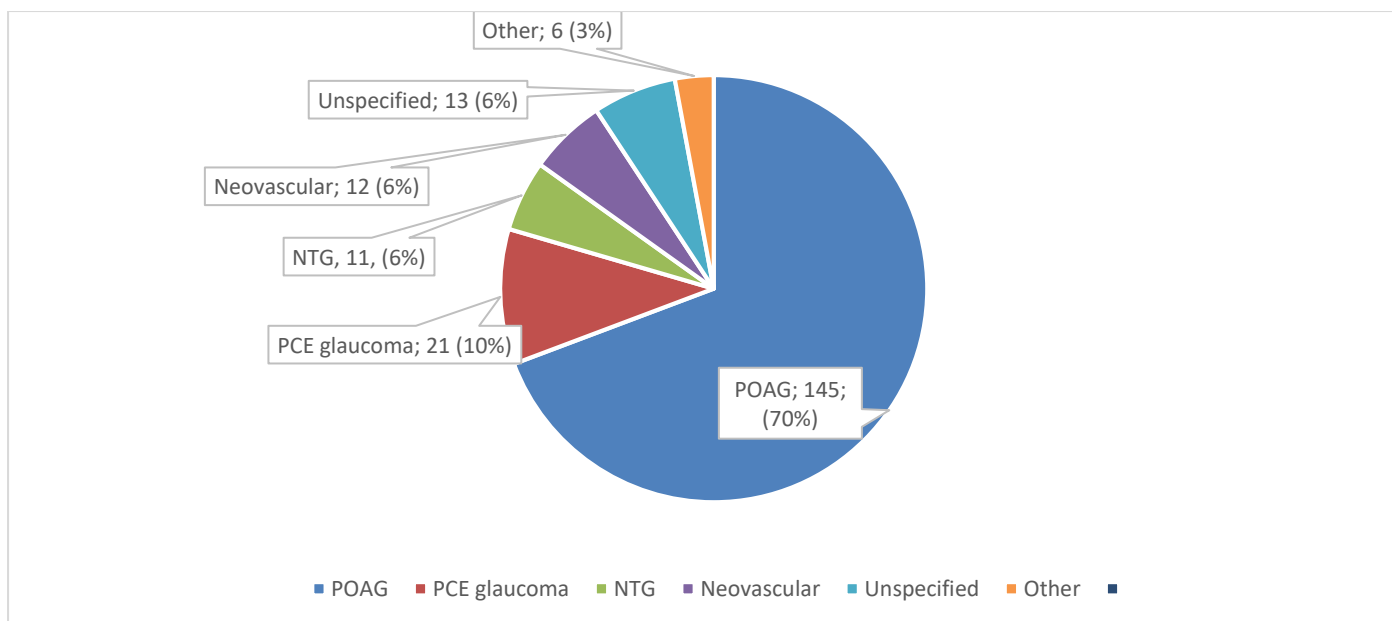


Fig. 4.6 Subtypes of glaucoma in patients

POAG patients had a mean age of 64,0 years. The mean age of male and female patients with POAG was 64,0 years and 65,4 years respectively. The mean age of patients with pseudoexfoliation glaucoma was 74,5 years. The mean age of males and females with pseudoexfoliative glaucoma was 73,6 years and 75,7 years respectively.

Pseudoexfoliation accounted for 34 (1,6%) patients. Fourteen (41,2%) and 20 (58,8%) were female and male respectively. All patients with pseudoexfoliation were African. The mean age of patients with pseudoexfoliation was 74,3 years. Amongst the patients with pseudoexfoliation 21 (61,8%) had glaucoma.

4.3.3 Ocular Trauma

There were 306 patients seen with ocular trauma. Sixty-two (19,5%) presented with globe-penetrating injuries whilst 244 (77,0%) presented with non-globe penetrating injuries. Eleven (3,6%) were just listed as trauma and not specified further. The oldest patient in whom trauma occurred was 83 years old with the youngest patient being 1-year-old. The mean age of patients

with ocular trauma was 31,5 years. Males and females accounted for 243 (76,7%) and 74 (23,3%) of patients with ocular trauma respectively.

4.3.4 Diabetic Retinopathy

Diabetes mellitus was recorded in the files of 287 (13,4%) patients. Table 4.4 below shows the severity of diabetic retinopathy in patients attending the eye department including the proportion of patients with macular oedema. Complications such as vitreous haemorrhage and tractional retinal detachment occurred in 13,6% (n=8) and 32,2% (n=19) of patients with proliferative diabetic retinopathy respectively. Fig. 4.7 shows the age distributions of patients with diabetes mellitus.

Table 4.4 Classification of diabetic retinopathy in patients attending Rob Ferreira Hospital eye department

<u>Classification of Diabetic Retinopathy</u>	<u>Number of patients with diagnosis (%)</u>
No diabetic retinopathy	133 (46,3%)
Non-proliferative diabetic retinopathy	25 (8,7%)
Proliferative diabetic retinopathy	59 (20.1%)
Clinically significant macular oedema	20 (6.9%)
Diabetic retinopathy not otherwise specified	3 (1%)
No comment made regarding the presence of diabetic retinopathy	59 (20,6%)

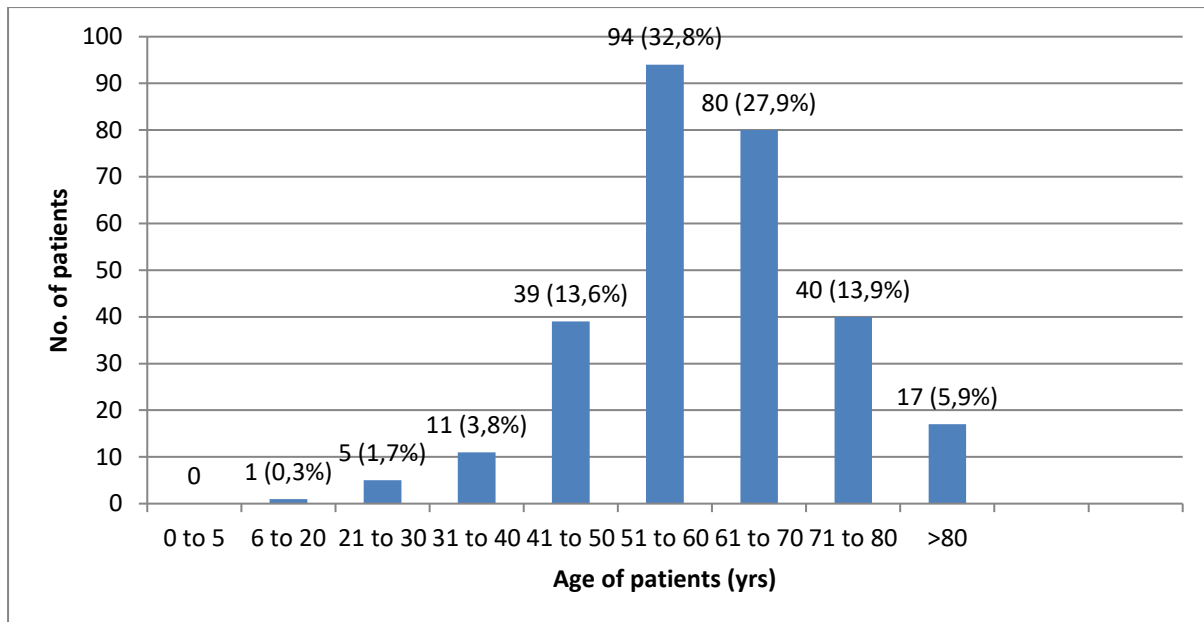


Fig. 4.7 Age distributions of patients with diabetes mellitus

4.3.5 Vitreo-retinal disease (Other than DR)

Various vitreo-retinal pathologies (other than DR) that patients presented to the eye department with are illustrated in figure 4.8. Vitreo-retinal disease accounted for 7,1% of patients presenting to the hospital.

Retinal detachments comprised 2,4% of all patient attending the eye department and 34% of patients with vitreo-retinal pathology. The mean age of patients with retinal detachments was 47,4 years. Of all the patients with retinal detachments, 7 (13.7%) were bilateral and 44 (87.8%) were unilateral. This amounted to 58 eyes with retinal detachment. Of the eyes with retinal detachment, 34,5% (n=20) were tractional, 19,0% (n=11) were rhegmatogenous, 1,7% (n=1) was serous and 44,8% (n=26) were not specified.

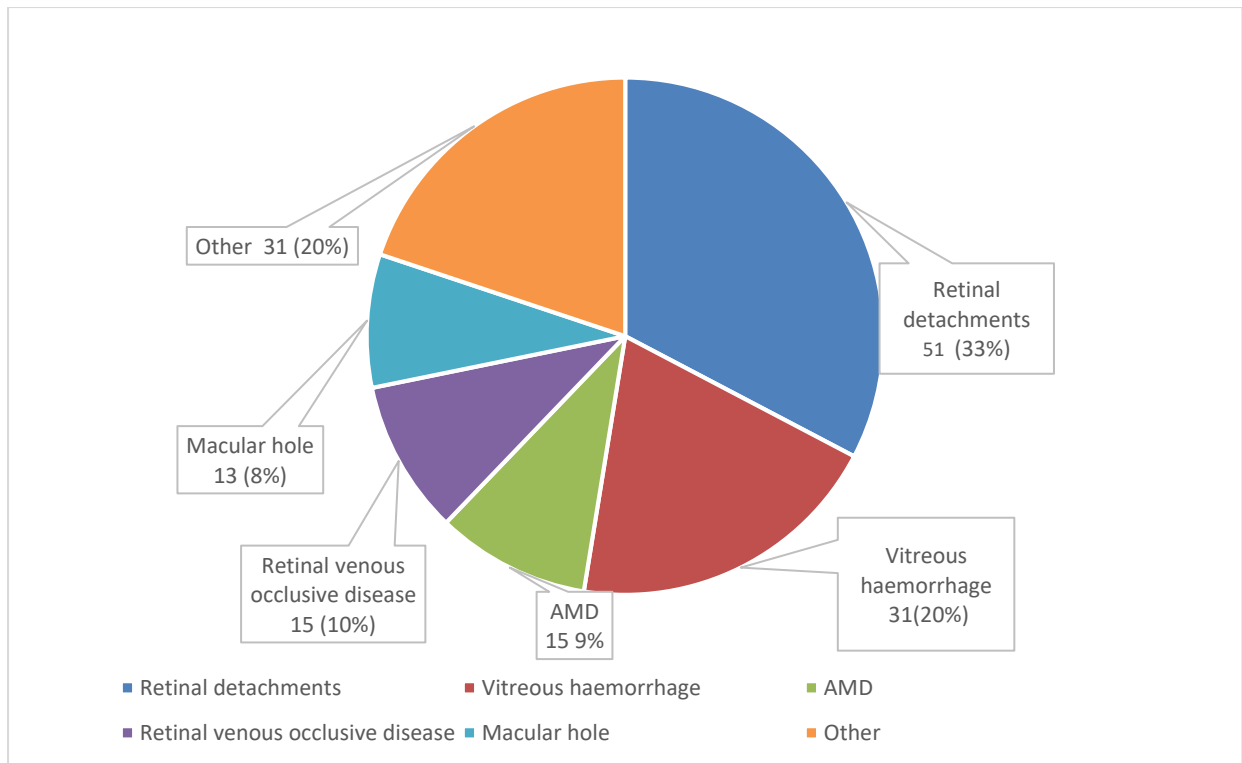


Fig. 4.8 Types of vitreo-retinal disease amongst patients attending Rob Ferreira Hospital eye department

AMD occurred in 15 (0,8%) patients. Thirteen (86,6%) of these patients were White and 2 (13,4%) were African. Six (40%) of patients were female and 9 (60%) were male. The mean age of patients with AMD was 75,0 years (range: 58-94 years).

Retinal venous occlusive disease was diagnosed in 15 (0,7%) patients. Of these, CRVO accounted for 10 (66,7%) patients and BRVO accounted for 5 (33,3%) patients. The mean age of patients with retinal venous occlusive disease in general, CRVO and BRVO was 67,2 years, 71,6 years and 58,4 years respectively. Six (60%) of patients with CRVO were known to have glaucoma.

Thirteen (0,6%) patients were diagnosed with a macular hole. Seven (53,8%) and 6 (46,2%) were female and male respectively. Three (23,1%) patients were White and 10 (76,9%) were African. The mean age of patients was 60,2 years.

Other causes of vitreo-retinal disease were CMV retinitis (n=9), asteroid hyalosis (n=5), CRAO (n=5), commotio retinae (n=4), retinitis pigmentosa (n=4) and acute retinal necrosis (n=1). CMV Retinitis was found in 9 (0,4%) of the total patients who presented to the clinic and in 4,8% of the HIV positive patients at the clinic. Eight (88,9%) of patients had a CD4 count documented. The mean CD4 count of the patients diagnosed with CMV retinitis was 52 (range: 7-109). Three (33,3%) and 6 (66,7%) of the patients with CMV retinitis were male and female respectively. The mean age of patients with CMV retinitis was 37,0 years (range: 23-54 years). Five (0,2%) patients were diagnosed with central retinal artery occlusion (CRAO). The mean age of patients with CRAO was 50,8 years.

4.3.6 Conjunctival disease

The various conjunctival diseases that patients presented with to the eye department at Rob Ferreira hospital are illustrated in figure 4.9. Pterygia were found in 176 (8,2%) patients attending the eye clinic, thus comprising 48,9% of patients with conjunctival disease. Of these, 79 (49,4%) were unilateral and 89 (50,6%) were bilateral thus representing 277 eyes with pterygia. The mean age of patients with a pterygium was 51,6 years.

Ninety (4,2%) patients were diagnosed with allergic conjunctivitis. Of these, 68 (75,6%) were vernal keratoconjunctivitis (VKC) and 22 (24,4%) were atopic keratoconjunctivitis (AKC). Thirteen (19,1%) of patients with VKC were classified as severe. VKC was the diagnosis in 42 (61,8%) male patients and 26 (38,2%) female patients. The mean age of patients with VKC was 12,5 years old. Fourteen (20,6%) patients with VKC were adults. If we disregarded these patients, the calculated mean age of patients with VKC was 8,3 years. AKC was present in 15 (68,2%) female patients and 6 (27,3%) male patients. One (4,5%) patient did not have a sex specified. The mean age of the patients with AKC was 39 years.

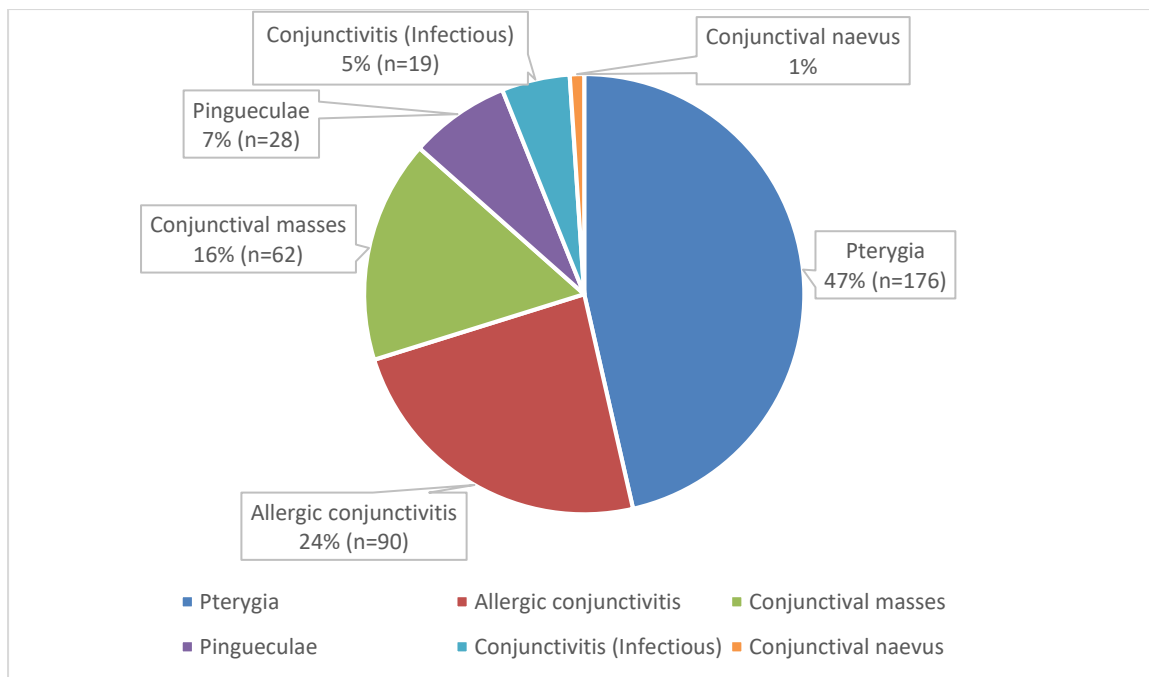


Fig. 4.9 Types of conjunctival diseases amongst patients attending Rob Ferreira Hospital eye department

Conjunctival masses were diagnosed in 62 (2,9%) patients. Thirty-one (50,0%) patients were male and 31 (50%) patients were female. The mean age of patients presenting with conjunctival masses was 39,1 years (5-94 years). Of the patients who had conjunctival masses, 23 (37,1%) were documented to be HIV positive. The mean CD4 count of HIV positive patients was 190,1 (range: 2-786). Excisional biopsies were performed in 62,9% (n=39) of patients and 89,7% (n=35) of these patients had histology results recorded in their files. The histology results are summarised in figure 4.10 below.

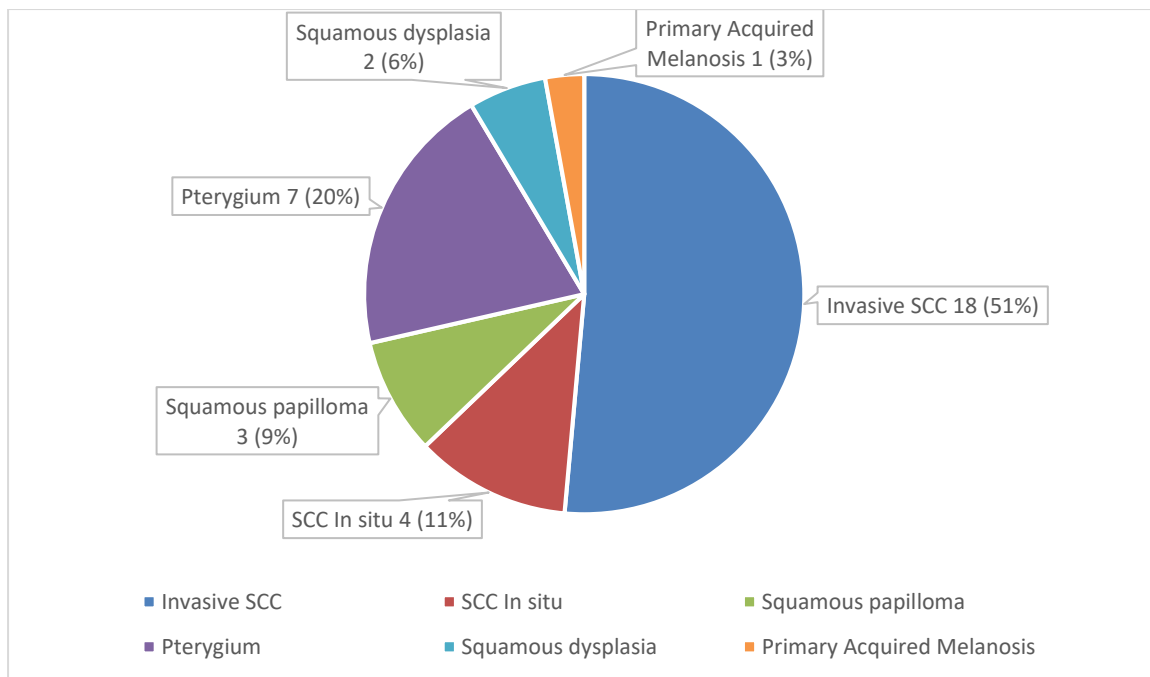


Fig. 4.10 Histology of patients with conjunctival masses

Pingueculae accounted for 28 (1,3%) patients at the hospital and 7% of patients with conjunctival disease. Twelve (42,9%) patients had bilateral disease and 16 (57,1%) patients had unilateral disease resulting in 40 eyes diagnosed with pingueculae. Eight (28,6%) patients were male and 20 (71,4%) patients were female respectively. The mean age of patients with pingueculae was 45,0 years.

Infectious conjunctivitis was diagnosed in 19 (0,9%) patients. Five (26,3%) of these were diagnosed with viral conjunctivitis. Gonococcal conjunctivitis accounted for 3 (15,8%) patients with conjunctivitis. In 11 (61,1%) patients no cause for the conjunctivitis was specified.

4.3.7 Corneal disease

Corneal diseases are illustrated in figure 4.11 below. Keratitis/corneal ulcers occurred in 57 (2,7%) patients. Thirty-one (54,4 %) patients were male and 26 (45,6%) patients were female. The aetiology of patients with keratitis is shown in table 4.5 below. The mean age of patients with keratitis was 41,0 years.

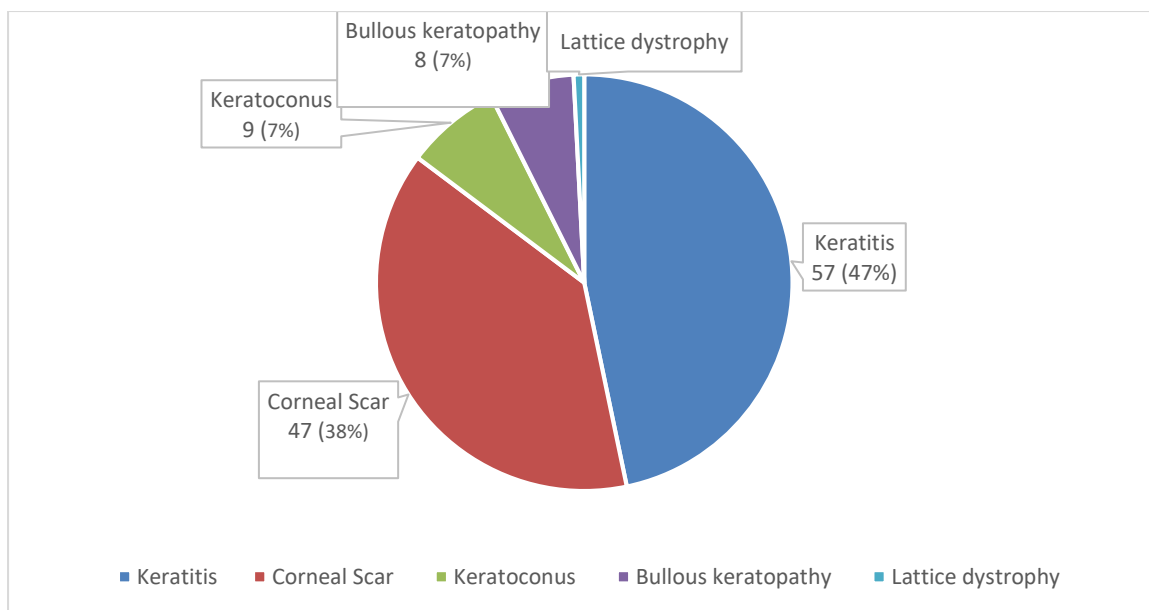


Fig. 4.11 Types of corneal diseases in patients attending Rob Ferreira Hospital eye department

Table 4.5 Aetiology of keratitis amongst patients

<u>Aetiology of keratitis</u>	<u>Number of patients (%)</u>
Viral	23 (40,4%)
• Herpes Simplex virus	16 (69,6%)
• Varicella Zoster virus	6 (26,1%)
• Unspecified	1 (4,3%)
Bacterial	4 (7,0%)
Fungal	2 (3,5%)
Unspecified	28 (49,1%)

Keratoconus occurred in 9 (0,4%) patients. Only 1 case was reported to be unilateral. Six (66,7%) patients were male and 3 (33,3%) patients were female. Two (22,2%) patients had acute hydrops. The mean age of patients with keratoconus was 14,6 years (range:5-19 years).

5.1.1 Uveitis

Uveitis occurred in 81 (3.8%) patients. Forty-nine (60,5%) patients with uveitis were male and 32 (39,5%) patients with uveitis were female. The mean age of patients with uveitis was 38,0 years (range: 7-91 years). The mean age of female and male patients with uveitis was 42,2 years and 35,2 years respectively. The anatomical location of uveitis amongst patients is shown in table 4.6 below. The age distribution of patients with uveitis attending the eye department is shown in figure 4.12 below.

Table 4.6 Classification of uveitis according to anatomical location

Uveitis	Number of patients (%)
Total	81 (3,8%)
• Anterior	61 (75.3%)
• Panuveitis	9 (11.0%)
• Not specified	11 (13.6%)

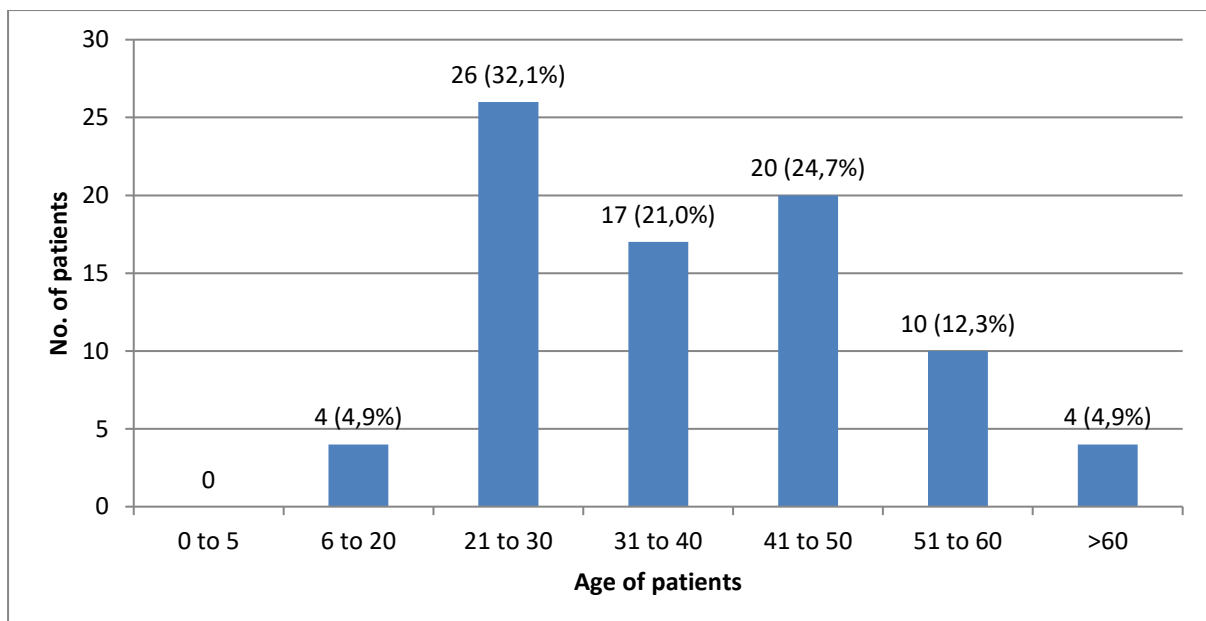


Fig 4.12 Age distributions of patients with Uveitis

5.1.2 Neuro-ophthalmic disease

Various neuro-ophthalmic diseases are shown in figure 4.13 below.

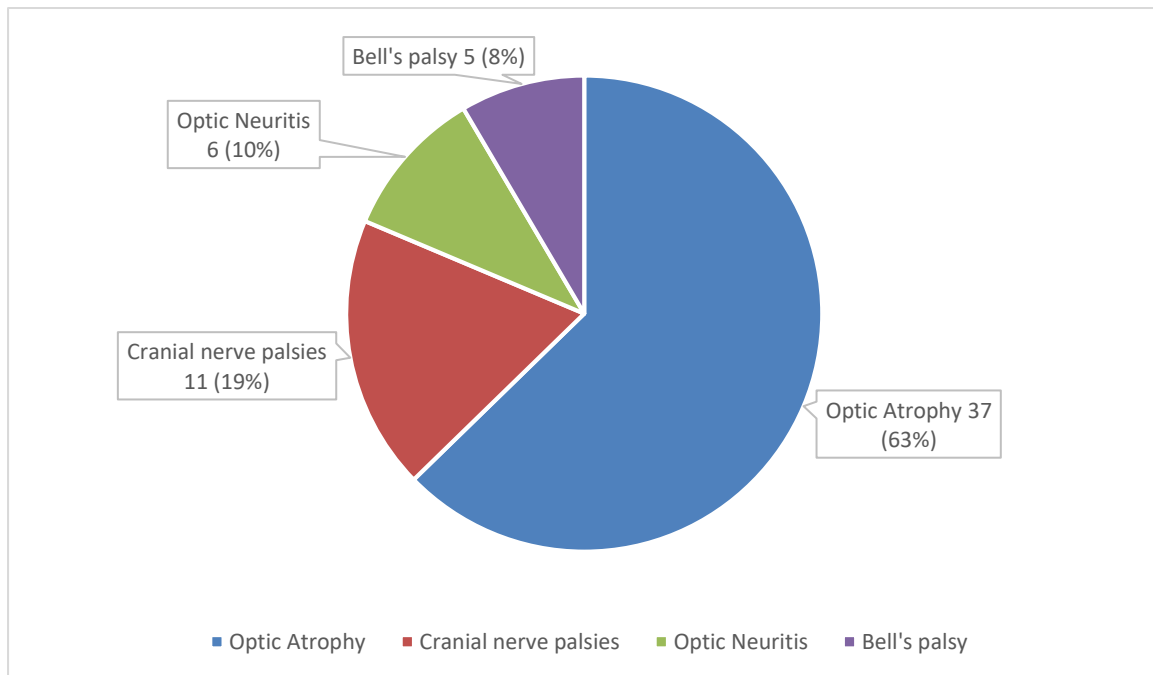


Fig 4.13 Neuro-ophthalmic diseases

Optic atrophy was found in 37 (1,7%) patients attending the eye department and 63% of patients with neuro-ophthalmic disease. The various causes of optic atrophy are shown in figure 4.14 below. Seventeen (45,9%) patients were female and 20 (54,1%) patients were male. Sixteen (43,2%) patients had unilateral optic atrophy and 21 (56,8%) patients had bilateral optic atrophy. The mean age of patients diagnosed with optic atrophy was 41,9 years.

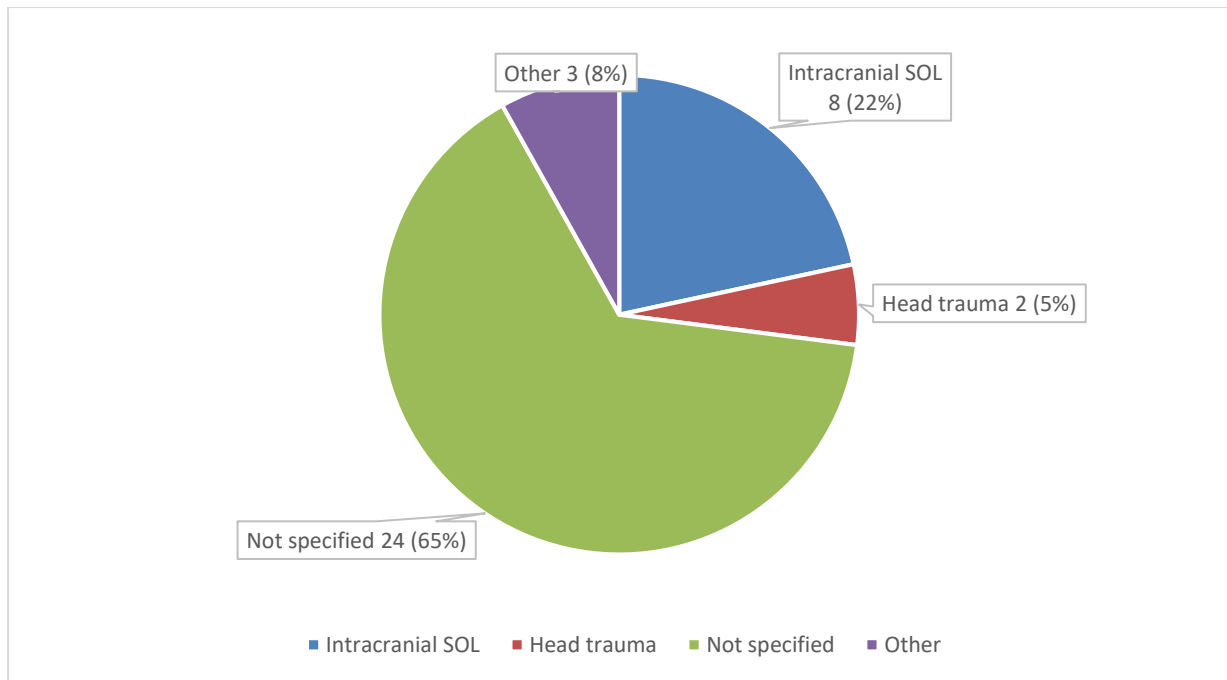


Fig 4.14 Causes of optic atrophy

Optic Neuritis was diagnosed in 6 (0,3%) patients attending the eye department and in 10% of patients with neuro-ophthalmological conditions. There were 4 female and 2 male patients. The mean age of the patients with optic neuritis was 33,8 years.

Cranial Nerve palsies (other than Bell's palsy) were diagnosed in 11 (0,5%) patients who attended the eye department. Multiple cranial nerves were involved in 3 (27,3%) patients and single cranial nerves were involved in 8 (72,7%) patients. The mean age of patients with cranial nerve palsies was 35,6 years.

5.1.3 Other

There were numerous other conditions that were diagnosed at the out-patients department during this period. Those are illustrated below in figure 4.15.

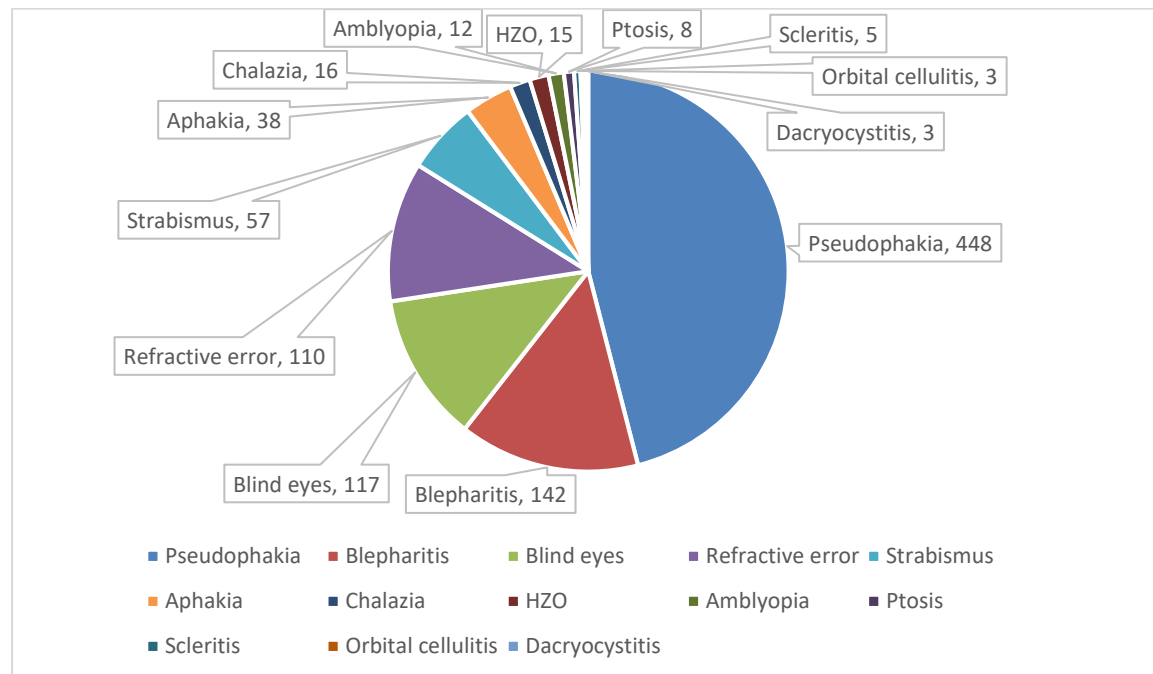


Fig 4.15 Other ophthalmic conditions in patients attending Rob Ferreira Hospital eye department

Pseudophakia was found in 448 (20.9%) patients. Of these, 145 (32.4%) were bilateral and 303 (67.6%) were unilateral. This represented a total of 593 eyes that were pseudophakic. The mean age of patients who were pseudophakic was 63,3 years (range: 1-102 years).

Blepharitis occurred in 142 (6.6%) patients. The mean age of patients diagnosed with blepharitis was 50,5 years. Sixty-eight (47,8%) patients with blepharitis were male and 74 (52,1%) patients with blepharitis were female.

Strabismus was found in 57 (2.7%) patients attending the eye department. Of these, 44 (77,2%) were esotropias and 13 (22,8%) were exotropias. Twenty-nine (50,9%) patients with strabismus were female and 28 (49,1%) patients with strabismus were male. The mean age of patients with strabismus was 10,86 years (0,33-74 years).

Blind eyes (listed as a diagnosis in the patient's file) were diagnosed in 117 (5,5%) patients.

The mean age of patients with blind eyes was 53,6 years.

Thirty-eight (1,8%) patients were aphakic. Twenty-five (65,8%) of these patients were male and 13 (24,2%) were female. The mean age of patients with aphakia was 54,9 years. Eighteen (47,4%) patients who were aphakic were aphakic due to previous trauma and 3 (7,9%) were aphakic post cataract surgery

Herpes Zoster Ophthalmicus (HZO) was diagnosed 15 (0,7 %) patients. Of these, 9 (60,0%) were female and 6 (40,0%) were male. The mean age of patients with HZO was 41,7 years. Four (26,7%) patients with HZO had an associated keratitis.

Sixteen (0,7%) patients presented with chalazia. The mean age of patients presenting with chalazia was 33,0 years. Of the patients diagnosed with chalazia, 7 (43,8%) were female and 9 (56,2%) were male.

Refractive error accounted for 110 (5,1%) patients seen at the ophthalmology department. Fifty-nine (53,6%) were female and 51 (46,4%) were male.

Ptosis accounted for 8 (0,4%) patients seen during this period at the clinic. The mean age of patients with ptosis was 37,8 years. Of the patients diagnosed with ptosis, 5 (62,5%) were male and 3 (37,5%) were female.

5.2 Staff and equipment

Rob Ferreira Hospital is one of the tertiary referral centres located in Nelspruit, Mpumalanga. Its ophthalmology department has one full-time ophthalmologist, two sessional ophthalmologists (1 who works twice a month and the other who works four times a month) and two full-time medical officers. There is also 1 ophthalmically trained nurse and 1 nursing assistant.

The following machines are available at the hospital:

- 2 slit lamps
- 1 argon laser
- 1 Nd-YAG laser
- 1 Infiniti phacoemulsification machine
- 1 A-Scan
- 1 Autorefractor

These machines are used for the diagnosis and management of basic ophthalmic diseases.

The following machines are not available in the eye department:

- Visual field machine
- Optical biometry
- Corneal cross-linking machine
- Lensmeter
- Pentacam
- Optical coherence tomography (OCT) machine
- Glaucoma diagnosis (GDx) machine
- Pars plana vitrectomy (PPV) machine

CHAPTER 5

DISCUSSION

The aim of the study was to describe the burden of ophthalmic disease at Rob Ferreira Hospital Eye Department in Mpumalanga from 01 January 2012 to 31 December 2012 and to identify any deficiency in the staff as well as diagnostic and therapeutic equipment available to cope with this disease burden at the hospital. The study provides some insights into the burden of disease at a tertiary hospital in one of the rural provinces in South Africa.

There were 2493 patients seen at the hospital during the period reviewed. The out-patients clinic at the hospital occurs twice weekly at the hospital. Of these, 2142 patient records (85,9%) were available and reviewed. The vast majority of the patients seen at the hospital were from its drainage area, the Mbombela South municipality. The Mbombela North municipality is served by Themba hospital. Complicated cases from Themba hospital are then referred to Rob Ferreira hospital. Only the major ophthalmic diseases seen at Rob Ferreira hospital during the specified review period will be discussed.

There were 1912 (89,3%) Black patients, 197 (9,1%) White patients, 19 (0,9%) Indian patients and 13 (0,6%) Coloured patients seen at the hospital during this period. When comparing this to the census data in the province Black people, White people, Indian and Coloured people represent 90,9%, 7,5%, 0,7% and 0,9% of the population respectively.¹ Indian patients and White patients are thus slightly over-represented. This could be because they have easier access to healthcare due to the past socio-economic conditions (i.e. living closer to the hospital) in the area. Coloured patients are under-represented which could be because they do not have easy access to ophthalmology services.

This study found that there was a male preponderance of patients attending the eye clinic when compared to females (53,2% vs. 46,5%). According to census data, in Mpumalanga, 7,3% of male patients and 9,8% of female patients report some difficulty with seeing; 1,2% of males and 1,7% of females report a lot of difficulty with seeing; and 0,1% of males and 0,2% of females report not being able to see at all. Although there are more females of older age groups in the province and more females report visual disability to some degree, males form the majority of patients attending the hospital and therefore accessing ophthalmology services. Population-based studies in South Africa have also showed a female preponderance of blindness and visual impairment.^{9,12} A hospital-based study however showed that the proportion of males and females differed by ethnic group with less black males vs. females when compared to their White counterparts.²⁴ A possible explanation for this difference in our study is that males (especially in a rural province) are more economically active than females and therefore have easier access to ophthalmology services whilst females are more dependent on their male counterparts.

The age distribution of the patients attending Rob Ferreira Hospital shows that most patients were between the third and the eighth decade, even though the majority of the population in the province is less than 30 years of age. This is in keeping with the norm as several ophthalmological diseases are age-related.^{5,9,12,24}

Most ophthalmic diseases presenting to Rob Ferreira hospital in Mpumalanga, are preventable causes of blindness. Most of the patients seen at the hospital presented with cataract, trauma and glaucoma. These are preventable causes of blindness with hospital-initiated interventions such as increasing cataract surgical rates, and the detection and

management of glaucoma essential to reducing disease morbidity. This finding corresponds to many studies globally that showed that most causes of blindness are preventable.^{2,5,11}

Cataracts were diagnosed in 832 (38,8%) patients and in 1332 eyes. Sixty percent of patients with cataracts had bilateral disease and mature cataracts were diagnosed in 27,4% of eyes with cataracts. Cook *et al* found that the prevalence of blindness due to untreated cataract in Kwa-Zulu Natal in 1990 and 1993 remained constant at 0.59%.¹² This is much lower when compared to our study. Our study however reflects a hospital-based prevalence whilst Cook *et al* reflects a population-based prevalence. Patients with mature cataracts have suffered from visual loss for longer than they should have, especially with ophthalmology services available in the province. Health promotion is essential at local clinics to make people aware that they should be examined once they have visual problems. The age group between 6 to 20 years also accounted for 6,0% of cataracts compared to 0 to 5 years which only accounted for 1,9%. This is a lot higher when compared to a hospital-based study in china which found that congenital cataract only accounted for 2.39% of all cataract patients.⁴⁵ Patients are therefore presenting at a later age with visual impairment and possibly amblyopia. This can lead to numerous problems later in life with education and employment prospects being adversely affected. Health promotion with better screening at primary health care facilities is essential to reduce this preventable cause of blindness, especially amongst this age group.

Glaucoma was diagnosed in 208 (9,7%) patients. This is much lower when compared to a hospital-based study in Saudi Arabia which showed a glaucoma prevalence of 21.5%.⁴⁶ A possible reason for this is missed diagnoses in our study or patients not presenting to the clinic. If we use a population-based prevalence of 4,5% for glaucoma as calculated by Rotchford *et al*, this should give us a total prevalence of patients with glaucoma in

Mpumalanga and Mbombela sub-district of 151 450 and 26 495 respectively. This is in stark contrast to the 208 patients that presented to the Rob Ferreira Hospital Ophthalmology department. We can possibly infer from these numbers that glaucoma is severely underdiagnosed in the province since most patients rely on public healthcare. This is further supported by our finding that 20,1% of glaucoma patients were diagnosed as having advanced or end-stage disease. Patients are thus presenting too late for vision-saving interventions to be of benefit to them. This is one area in which the hospital urgently requires improvement. There is no visual field machine, glaucoma diagnosis (GDx) machine or Optical Coherence Tomography (OCT) machine to assess and diagnose glaucoma in the early stages of the disease. These machines are all essential for the diagnoses and long term management of glaucoma patients. This represents an opportunity for a direct intervention to be instituted that will impact the quality of life of patients in that province. Screening programs should also be instituted in the province to detect patients with glaucoma earlier and possibly the large proportion of patients who would otherwise remain undiagnosed. POAG was also the most frequently encountered type of glaucoma which correlates with what has been previously found in Kwa-Zulu Natal.¹³

Ocular trauma accounted for 14,7% of patients seen in the ophthalmology department. In our study patients in their third decade of life comprised the largest proportion of patients with ocular trauma with a mean age of 31,5 years. The mean age of patients with ocular trauma in our study is higher than the Kwa-Zulu Natal study by Cook but lower than the study conducted in the USA by Scruggs *et al.*^{17,18} The male preponderance (76,7%) of patients in our study is in keeping with the studies from both countries. This study also found that it is the economically active and school-going populations which are most affected. There was a high proportion of patients aged 0 to 5 years (6,3%) and patients aged 6 to 20 years (16,7%)

who presented to the ophthalmology department because of ocular trauma. This requires further investigation to determine whether some of these injuries are due to non-accidental injury. Issues surrounding ocular trauma, however, require a broader approach, with multiple stakeholders including the department of education, social workers, religious groups and ordinary citizens to help reduce the rate of violence seen in many communities in South Africa.

The prevalence of diabetes mellitus in Africa is projected to increase by 98% from 12,1 million in 2010 to 23,9 million in 2030.⁴⁷ Type 2 diabetes is also more prevalent in rural areas when compared to urban areas which is different to what was previously thought. In our study, 287 (13,4%) of patients attending the eye clinic were known to have Diabetes Mellitus. Any form of diabetic retinopathy was present in 36,7% of patients with diabetes mellitus. This is higher when compared to the hospital-based study in Johannesburg by Carmichael *et al* which showed the prevalence of any form of DR to be 26,5%. The reasons for this higher rate requires further investigation. It is possible that the lack of access to primary healthcare in rural areas results in poorly controlled DM with subsequent higher progression rates to DR. A higher prevalence of DR in this study could be because it was conducted in an ophthalmology department whilst the study by Carmichael *et al* was conducted in the diabetic clinic. Patients in the ophthalmology department are more likely to have more severe DR when compared to the diabetic clinic. Proliferative DR was diagnosed in 20,1% of patients which is again higher than the study by Carmichael *et al* that showed only 11,7% of patients had severe retinopathy. Cockburn *et al* showed that the prevalence of sight-threatening diabetic retinopathy was 8,9%.²⁵ Even though these studies were conducted in diabetic clinics and not ophthalmology clinics, where the severe cases will be followed up, they do however show that NPDR is more prevalent than PDR. This is in keeping with the global prevalence

of DR and a meta-analysis in China which showed that NPDR is more common than PDR.^{21,22} In our study, however, we see that patients often present with advanced disease; 32,2% and 13,8% of patients with proliferative diabetic retinopathy have tractional retinal detachments and vitreous haemorrhage respectively. The age group at which our patients with proliferative diabetic retinopathy present is also much later, with most patients presenting after 50 years of age. This reflects a possible breakdown in the referral system since all patients who are diagnosed with diabetes mellitus and are collecting medication at their local clinic should be screened by their general practitioner or if none is available, be referred for screening. In our study, 6,4% of the patients had diabetic macular oedema. Anti-VEGF agents are the first choice of treatment for diabetic macular oedema.⁴⁸ Rob Ferreira hospital does not offer anti-VEGF therapy as part of its treatment of diabetic macular oedema as it is not available in the hospital. With the diabetic epidemic set to increase, there will be a lot more patients with potentially treatable causes of visual impairment who will remain untreated. An OCT machine is also required to aid diagnosis of macular oedema and to monitor treatment efficacy.

Ninety (4,2%) patients were diagnosed with allergic conjunctivitis in our study. This number is considerably low when compared to population-based studies in Japan, Pakistan and Ghana.⁴⁰⁻⁴² A population-based epidemiological study in South Africa is needed to further define this burden of disease. If we assume the national prevalence of the disease is similar, then we are not adequately addressing the problem of allergic conjunctivitis. This is probably the result of several factors namely, poor patient or parent education, the dependence of children on adults for their healthcare needs and lack of referral systems. In contrast to the study by Kumah *et al* in Ghana which showed a female preponderance of patients with VKC, our study showed a male preponderance (61,8%).⁴²

The burden of vitreo-retinal disease other than DR is 7,1% of the patients attending the eye clinic. This is almost twice as high as the hospital-based study in Nigeria.³⁰ This is despite DR being recorded in a separate group of patients in this study. There were, however, no vitreous haemorrhages recorded in their study which could have resulted in a lower hospital-based prevalence. Rob Ferreira hospital currently does not offer any vitreoretinal surgical services. As discussed earlier, with a high burden of trauma and the projected increase in patients with DM, it is important for the hospital to offer vitreo-retinal surgery services. Patients are not treated and subsequently go blind from a treatable condition. The burden of the disease is also possibly underestimated since some patients may not return to the hospital once no definitive treatment can be offered. In terms of equipment, a B-Scan ultrasound is also very important to assess the posterior poles of patients with media opacities. The hospital however does not possess one.

CMV retinitis accounted for 0,9% of patients seen between 01 January 2012 to 31 December 2012. This is very low compared to other hospital-based studies such as in Shanghai, China, where a prevalence of 7,6% was noted.²⁸ This could be due to more patients receiving anti-retroviral (ARV) therapy and having higher CD4 counts with no disease, or that patients are simply not presenting.

Conjunctival masses affected mainly the young economically productive population between the 3rd and 4th decade of life. This is due to the HIV pandemic affecting South Africa. The optimal place for the diagnosis of these patients is the HIV clinics or community-based general practitioners (GPs). They can then be referred to the eye department for definitive management. Continuing education of HIV practitioners and GPs is important to ensure that

these patients are identified and referred timeously. The hospital has adequate facilities to treat conjunctival masses.

Corneal scars only accounted for 2,2% of patients attending the ophthalmology department. Almost one third (29,4%; n=15) of the corneal scars were caused by trauma and 21,6% (n=11) were caused by a previous keratitis. A population-based study in India by Gupta *et al* shows similar rates of corneal scars secondary to trauma but a much lower prevalence of scars secondary to keratitis.⁴⁹ This difference may be because this study is hospital-based. A review of corneal blindness by Smith *et al* however showed a much lower rate of corneal opacity secondary to trauma (5%) in Zambia.⁵⁰ Rob Ferreira hospital does not offer any corneal transplant services, cross-linking services or refractive surgery services. Patients with corneal scars and corneal pathology such as keratoconus are therefore not able to benefit from such services and potentially treatable and often preventable causes of visual impairment are left untreated.

Four hundred and forty-eight (20,1%) of the hospital patients were pseudophakic, indicating that patients are receiving this ophthalmology service at the hospital. This result is inherently biased due to it being a hospital-based prevalence. Further population-based studies are required to ascertain the cataract surgical cover rates.

The Ehlanzeni district has 1 688 615 residents which means that 1 ophthalmologist serves this entire population. This is well below the norm for the country and the rest of the world.⁴⁴ Sub-Saharan Africa has the lowest number of ophthalmologists (2,7 per million) whilst former socialist countries showed the highest number of ophthalmologists (88,3 per million). South Africa had 7 ophthalmologists per million population in 2010, although no distinction

was made between ophthalmologists in private and public service. This ophthalmologist to population ratio in the Ehlanzeni district could be even lower, since it does not consider patients referred from other districts, provinces and countries. Themba hospital located within the same district also provides an eye care service, however, it is run by medical officers and not qualified ophthalmologists. Rob Ferreira has two sessional ophthalmologists who render their services but they are not regularly available to assist with the patient load. The first ophthalmologist assists with a cataract surgery list once every two weeks whilst the second ophthalmologist is available for a half day clinic and a half day theatre list every two weeks. Rob Ferreira hospital does not offer any advanced ophthalmic services that are required for the management of many of these patients.

Finally, to efficiently and holistically manage most ophthalmic pathology seen at this hospital, a much more extensive assemblage of equipment is needed. Many patients are therefore inadequately and ineffectively managed resulting in subsequent blindness or living with significant visual impairment. The equipment deficiencies have been discussed earlier together with each disease.

As with all retrospective studies, there are several limitations to this study. The first limitation is that it is a hospital-based study that inherently has some bias associated with it. Diseases were omitted from the discussion if the number of patients presenting with the disease were very small, the disease was not visually significant, no intervention was required or a combination of the above reasons. Another possible limitation is that it is not a population-based study and therefore the true prevalence of disease cannot be calculated. It is, however, possible to analyse disease profiles in the hospital and extrapolate presentation patterns, for example, advanced disease at presentation. Decisions can therefore be made pertaining to resource allocation to decrease the morbidity of patients. Since this is not a prospective study,

data interpretation can be difficult as the clinician who assessed the patient could omit minor diagnoses (e.g. Grade 1 hypertensive retinopathy) and this in turn could affect the outcome when calculating the burden of disease. Certain diseases such as retinopathy of prematurity cannot be accurately reflected in a study such as this one, since those patients were assessed in the neonatal ICU or neonatal ward. The records of such patients are not kept in the eye department register. This also applies to ward consultations requested by other specialities, since these consultations are not recorded in the eye department register. Further population-based studies in the province are required to define the prevalence of the various diseases. The intention of the author was to describe the burden of disease presenting at a particular healthcare facility and the adequacy of the available equipment and staff to ascertain what immediate and long-term interventions are needed to decrease patient morbidity.

CHAPTER 6

CONCLUSIONS AND RECOMMENDATIONS

This study primarily determined the prevalence and burden of various eye diseases and conditions presenting to the eye department at the Rob Ferreira hospital in 2012. This study has also found that although there is an ophthalmology service at Rob Ferreira Hospital, it is either inadequate or lacking the necessary equipment and resources in certain key areas. Improvements in resources (equipment, medication and staff) are required to better serve the population of the province. However, the emphasis should not be solely placed on the hospital. Good screening and referral mechanisms from outlying hospitals and clinics are essential to improving service delivery. The following recommendations are therefore made:

6.1 Short-term

Most short-term recommendations are regarding staff and equipment. The following is urgently required to have a fully functioning ophthalmology department:

1. OCT machine to assist in the diagnosis and monitoring of macular oedema and glaucoma.
2. Optical biometry machine.
3. Lensmeter for spectacles.
4. Visual field machine to assist in the diagnosis of glaucoma.
5. PPV machine for vitreoretinal surgery.
6. Bevacizumab (Avastin) for intravitreal injection to treat macular oedema.
7. Donor corneas for transplantation.
8. Corneal cross-linking machine for keratoconus.
9. B-Scan ultrasound machine.

10. Increase in staff- more ophthalmologists are required in order to provide a better service including community outreach.

6.2 Long-term

By increasing the number of staff at the hospital, outreach programs can be started and expanded and better eye services will be provided in the province. Health promotion is required to better educate patients regarding the signs of ophthalmic disease especially those that are preventable. Health-seeking behaviour of patients also needs to be modified so that they present appropriately. Ophthalmic trained nurses placed at the primary healthcare centres will also ensure that more adequate screening programmes are in place in order to improve referral mechanisms at hospitals.

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APPENDICES

Appendix A

Patient Data Collection Sheet

Patient Code:	Age :	Sex :	Race :	Co- morbidity :	Code for Diagnosis/es : E.g. 1- cataract, 2- glaucoma	Surgical Intervention :	Histology result (if applicable) :

Appendix B

Staff and equipment Data Collection Sheet

Equipment at CMJAH	Equipment at Rob Ferreira Hospital
Slit-lamps	Yes ☐ No ☐ Number: _____
A-Scan	Yes ☐ No ☐ Number: _____
B-Scan	Yes ☐ No ☐ Number: _____
Lensmeter	Yes ☐ No ☐ Number: _____
Optical biometry machine	Yes ☐ No ☐ Number: _____
Corneal crosslinking machine	Yes ☐ No ☐ Number: _____
OCT	Yes ☐ No ☐ Number: _____
Visual field machine	Yes ☐ No ☐ Number: _____
Pentacam	Yes ☐ No ☐ Number: _____
GDx machine	Yes ☐ No ☐ Number: _____
Phaco-emulsification machine	Yes ☐ No ☐ Number: _____
Pars Plana vitrectomy machine	Yes ☐ No ☐ Number: _____
Microscope	Yes ☐ No ☐ Number: _____

Staff	Number in Eye department
Ophthalmologists	
Medical Officers in Ophthalmology	
Ophthalmic trained nurses	

Appendix C

Ethics Clearance Certificate



R14/49 Dr Naseer Ally

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)

CLEARANCE CERTIFICATE NO. M130643

NAME: Dr Naseer Ally
(Principal Investigator)

DEPARTMENT: Ophthalmology
Rob Ferreira Hospital, Nelspruit

PROJECT TITLE: Spectrum and Burden of Ophthalmic Disease in Patients
Presenting to Rob Ferreira Hospital, Mpumalanga

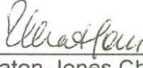
DATE CONSIDERED: 28/06/2013

DECISION: Approved unconditionally

CONDITIONS: Change of Supervisor

SUPERVISOR: Dr K. Kotsie

APPROVED BY:


Professor P. Cleaton-Jones Chairperson, HREC (Medical)

DATE OF APPROVAL: 06/06/2016

This clearance certificate is valid for 5 years from date of approval. Extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Research Office Secretary in Room 10004, 10th floor, Senate House/2nd floor, Phillip Tobias Building, Parktown, University of the Witwatersrand. I/We fully understand the conditions under which I am/we are authorised to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated, from the research protocol as approved, I/we undertake to resubmit to the Committee. **I agree to submit a yearly progress report.** The date for annual re-certification will be one year after the date of convened meeting where the study was initially reviewed. In this case, the study was initially reviewed in June and will therefore be due in the month of June each year.


Principal Investigator Signature

Date

07/07/2016

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES

Appendix D

FACULTY PROTOCOL APPROVAL

UNIVERSITY OF THE
WITWATERSRAND,
JOHANNESBURG



Private Bag 3 Wits, 2050
Fax: 027117172119
Tel: 02711 7172076

Reference: Ms Thokozile Nhlapo
E-mail: thokozile.nhlapo@wits.ac.za

03 March 2016
Person No: 0400218P
PAG

Dr N Ally
Po Box 1339
Lenasia
1827
South Africa

Dear Dr Ally

Master of Medicine: Approval of Title

We have pleasure in advising that your proposal entitled *Spectrum and burden of ophthalmic disease in patients presenting to Rob Ferreira Hospital, Mpumalanga* has been approved. Please note that any amendments to this title have to be endorsed by the Faculty's higher degrees committee and formally approved.

Yours sincerely

A handwritten signature in cursive script, appearing to read 'S. Benn'.

Mrs Sandra Benn
Faculty Registrar
Faculty of Health Sciences

Appendix E

Turnitin report

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MPYET, Caleb, ODUGBO, Perpetua, ADENUGA, Olukorede, VELLE, Lohdip and NYONKYES, Amos. "Prevalence and causes of blindness and visual impairment in plateau

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Publication