

Guidelines for the Comprehensive Management of Diabetic Retinopathy in India

A VISION 2020 The Right to Sight INDIA Publication

Developed by
ARAVIND EYE CARE SYSTEM



क्या आप मधुमेह के मरीज हैं?

- अगर हाँ तो याद रखें कि मधुमेह से अंधता का भी डर रहता है
- अपनी आँखें नियमित रूप से आँखों के डॉक्टर को दिखाएँ

और याद रखें कि अगर आपकी उम्र 40 साल से अधिक है तो आपको खतरा झंझटा है।

मेजु मेम संस्थान एवं अनुसंधान केंद्र 131, Sheela Sra, Institutional Area, Ph. 1, N. D-77, Ph. 202510311



Guidelines for the Comprehensive Management of Diabetic Retinopathy in India

July 2008

A VISION 2020: The Right to Sight INDIA Publication



Developed by
ARAVIND EYE CARE SYSTEM

MESSAGE

Diabetic retinopathy has been identified as one of the significant causes of blindness or vision impairment in India. Though cataract is still the leading cause of blindness, the intense work under the National Programme for Control of Blindness (NPCB) with the support of international non-governmental organisations has brought down its contribution to blindness from 80% in the year 1988 to 62% in year 2002.

There are 41 million of diabetics in India at present and every diabetic is a potential candidate for loss of vision due to diabetic retinopathy. This number is poised to increase significantly. Thus it is an appropriate time now to concentrate on diabetic retinopathy and bring the problem under control as we have done in the case of Cataract blindness. However, we have to recognize that the issues in managing vision impairment due to diabetic retinopathy are different from cataract. While cataract blindness is curable by a simple one time surgical intervention, diabetic retinopathy encompasses a multitude of problems and can be prevented if detected early and treated. It is an asymptomatic condition at the treatable stage but when a person presents for treatment with loss of vision, it often is too late for intervention. The National Eye Institute, Bethesda, USA has supported various trials and has established that laser treatment is beneficial for diabetic retinopathy. Early detection and management of risk factors responsible for diabetic retinopathy could postpone development of diabetic retinopathy or control its progression. The challenges lie not only in creating awareness amongst the lay public but also in the health professionals that persons with diabetes must undergo a detailed eye examination and that it has to be done periodically as advised. A systematic approach to health education and creating awareness among patients and various health personnel and matching it with appropriate screening and service delivery mechanisms will go a long way in preventing blindness due to diabetic retinopathy.

This manual titled “Guidelines for the Comprehensive Management of Diabetic Retinopathy in India” has been prepared by Aravind Eye Care System based on its experience of dealing with diabetic retinopathy in the community keeping the above factors in mind and the inputs received from Sightsavers team and their partners in India. This manual will prove to be an excellent guide for promoting awareness and preventing vision impairment due to diabetic retinopathy by developing effective interventions.

My hearty congratulations to the teams from Aravind Eye Care System and Sightsavers – India, who worked on this manual.

*Dr. P. Namperumalsamy
Chairman
Aravind Eye Care System, Madurai
India.*

FOREWORD

Diabetic retinopathy is a well recognised complication of diabetes mellitus. Services for prevention and treatment of diabetic retinopathy can only be developed if adequate medical services for patients with diabetes mellitus are in place. Screening programmes for detecting diabetic retinopathy in diabetic patients at a stage where treatment can prevent visual loss, as well as health education programmes, are the mainstay of blindness prevention from diabetic retinopathy. Treatment with lasers can slow down the progression of diabetic retinopathy and can stabilize vision. However once vision has been lost from diabetic retinopathy it usually cannot be restored apart from some forms of retinopathy which can be treated by complex vitreo-retinal surgery.

The World Health Organisation estimates that diabetic retinopathy is responsible for 4% of the 45 million cases of blindness due to eye conditions and uncorrected refractive error throughout the world (i.e. 1.8 million). However this figure is set to increase dramatically over the next twenty years. Currently it is estimated that at least 171 million people worldwide have diabetes; this figure is likely to more than double by the year 2030 to 366 million. Much of this growth will be in low income countries where existing programmes for the control of diabetes and hypertension and the treatment of established retinopathy are very poor or even non existent. By 2030 India will have an estimated 80 million diabetics the highest number of any country. It is entirely appropriate therefore that, in terms of the developing nations, India is leading the way in introducing diabetic retinopathy programmes.

This manual will be an invaluable guide for both Ophthalmic Staff and Programme Managers in planning and designing diabetic retinopathy control programmes. Its value will reach well beyond India. I would like to commend all those involved in the initiative to produce this manual – particularly Dr R. Kim, Chief Consultant of Vitreo-Retinal Services, Aravind Eye Hospital & Postgraduate Institute of Ophthalmology, Madurai and Mr. R.D. Thulasiraj, Executive Director, Aravind Eye Care System, Madurai and Mr. Pankaj Vishwakarma, Regional Programme Officer, Sightsavers India.

*Peter Ackland
Director of Overseas Programmes
Sightsavers International*

ACKNOWLEDGEMENTS

The development of these guidelines was initiated by Sightsavers International – India Region and is the culmination of consultations with partners, experts and Sightsavers staff to look at best practices for the management of diabetic retinopathy at primary, secondary and tertiary levels. It would not have been possible to develop it without the support and generous time provided by several individuals.

We are very thankful to Aravind Eye Care System, especially Mr RD Thulasiraj, Dr R Kim, Dr K Naresh Babu, Mr V Vijay Kumar and the Aravind communications team, under the mentorship of Dr P Namperumalsamy, for developing this document. Their wisdom and knowledge have contributed to a learning that has tremendous implications on the scope and quality of diabetic retinopathy services.

We appreciate the support and direction provided by the National Programme for Control of Blindness (NPCB), under the leadership of Dr (Mrs.) Rachel Jose, Additional Director General (Ophthalmology), Directorate General of Health Services, Ministry of Health and Family Welfare, NPCB, Government of India has made tremendous progress over the years and we look forward to a continuing synergistic partnership through VISION 2020: The Right to Sight - INDIA for the eradication of avoidable blindness.

We very much value the participation of our partners in India in developing these guidelines, especially Venu Eye Institute and Research Centre, Delhi and Ophthalmic Mission Trust, Gujarat and are thankful to them for their generosity in sharing their experiences and learning.

We appreciate the valuable inputs from Sightsavers International, especially Ms Elizabeth Kurian, Regional Director and Mr Pankaj Vishwakarma, Regional Programme Officer in the development of this document that is a useful reference guide for any initiative that has / intends services to manage diabetic retinopathy. We also appreciate Sightsavers' contribution towards the cost of developing and printing this manual.

Dr. Rajesh Noah

Executive Director

VISION 2020 The Right to Sight - INDIA

CONTENT

| | | |
|-----------|--|----|
| CHAPTER 1 | BACKGROUND INFORMATION ON DIABETES AND DIABETIC RETINOPATHY | 1 |
| | <ul style="list-style-type: none">- Rational for Diabetic retinopathy services in India- Definition of Diabetes- Diabetes and human body- Anatomy of the healthy retina- Diabetes and the Eye- What is Diabetic retinopathy?- Types of diabetic retinopathy- Risk factors of diabetic retinopathy. Who is at risk?- Symptoms of diabetic retinopathy- Management of diabetic retinopathy – laser photocoagulation, vitrectomy- Follow-up management- Instructions to diabetic patients- Frequently Asked Questions (FAQ) | |
| CHAPTER 2 | MAGNITUDE OF DIABETES AND DIABETIC RETINOPATHY | 8 |
| | <ul style="list-style-type: none">- Global prevalence of diabetes mellitus – WHO projections on Diabetes- Evidence base for Prevalence Diabetic Retinopathy and visual impairment in India | |
| CHAPTER 3 | DISEASE CONTROL | 15 |
| | <ul style="list-style-type: none">- Detection within eye care clinics (Primary, Secondary, Tertiary) | |
| CHAPTER 4 | HUMAN RESOURCE DEVELOPMENT AND ITS DEVELOPMENT | 18 |
| | <ul style="list-style-type: none">- Human Resources requirements at Primary, Secondary, Tertiary level - skills required | |
| CHAPTER 5 | INFRASTRUCTURE & EQUIPMENT | 20 |
| | <ul style="list-style-type: none">- Instruments and equipments requirements at Primary, Secondary and Tertiary level | |
| CHAPTER 6 | HEALTH INFORMATION FOR BEHAVIOURAL CHANGES | 22 |
| | <ul style="list-style-type: none">- Assessment of existing awareness – KAP study- Targeting awareness needs and messages- Developing strategies to raise awareness (Mass, Group, Individual)- Types of IEC materials and dissemination- Training of Medical, Paramedical Personnel, NGOs, and community | |
| | ANNEXURE: 1 - KAP Study Questionnaire | |
| | ANNEXURE: 2 - 2A - 2C - IEC Materials | |

| | | |
|------------|--|----|
| CHAPTER 7 | COMMUNITY BASED SCREENING MODELS | 49 |
| | - DR Screening camps, Types | |
| | - Effective strategy for success of the camp | |
| | - Diabetic Retinopathy screening camp protocol | |
| | - Manpower plan for DR Camp | |
| | ANNEXURE: 3 - Manpower Plan for DR Camp | |
| | ANNEXURE: 4 - Screening Protocol flow chart in camps | |
| | ANNEXURE: 5 - Camp case sheet | |
| CHAPTER 8 | NETWORKING AND LINKAGES | 57 |
| CHAPTER 9 | DELIVERING QUALITY DR SERVICES | 59 |
| | - Standardising clinical protocols | |
| CHAPTER 10 | INFORMATION TECHNOLOGY - EMERGING OPPORTUNITY IN DIABETIC RETINOPATHY SERVICES | 63 |
| | - Emerging opportunities in the use of IT in DR Strategies for case finding, diagnosis and treatment | |
| CHAPTER 11 | COSTING FOR DR SERVICES | 65 |
| | - Costs involved in various clinical procedures and treatment (both fixed and recurring) | |
| | - Cost involved in other activities (Awareness creation activities, community outreach screening) involved in DR Services | |
| CHAPTER 12 | PROGRAMME MANAGEMENT | 71 |
| | - Planning and implementation | |
| | - Monitoring | |
| | - Reporting | |
| | - Documentation | |
| | - Recommendations | |
| | - Strategy for control of blindness related to DR under NPCB | |
| | ANNEXURE: 6 - Performance Report | |
| | ANNEXURE: 7 - Financial Report | |

CHAPTER 1

Background Information on Diabetes and Diabetic Retinopathy

Rationale for Diabetic Retinopathy Services in India

This initiative is directed towards improving health care services for persons with diabetes and diabetic retinopathy. Diabetic retinopathy is one of the foremost frequent causes of blindness world-wide. In India, it was the 17th cause of blindness 20 years ago but has now ascended to the 6th position. The World Health Organisation under its VISION 2020 initiative aims to control eye diseases, and diabetic retinopathy is one among them. Awareness of the disease and of its treatment modalities among the community and physicians is low.

Diabetes mellitus currently affects more than 170 million persons worldwide, and this scale is estimated to touch 366 million by 2030. The eye is the most commonly affected organ by diabetes leading to Diabetic Retinopathy (DR). More than 75% of patients who have diabetes mellitus for more than 20 years will have some form of diabetic retinopathy. (Report of WHO consultation in Geneva, Switzerland, 9-11 November 2005).

According to WHO, 31.7 million people were affected by diabetes in India in the year 2000. This figure is estimated to rise to 79.4 million by 2030, the largest number in any nation in the world. It is estimated that 15 to 25% of the diabetic population have diabetic retinopathy, and everyone has the potential to develop it over a period of time.

Diabetic Retinopathy is symptomless in its early stage; screening is the only way to identify these patients to prevent them from going blind. The number of DR patients increase with increase in the diabetic population, especially in developing countries where there is resource scarcity. Timely treatment can prevent vision loss from diabetic retinopathy. This

means that all of the diabetics have to be regularly examined for DR.

The existing number of medical professionals trained in India to treat diabetic retinopathy is low. Currently there are only 11,000 ophthalmologists, and most of them are trained in cataract surgery. Only 7-8% of the ophthalmologists are trained in the management of DR. Some countries do not have any trained personnel for DR. Also, people do not access screening and treatment due to lack of awareness of the disease and lack of availability of resources and specialists. All diabetic patients have to be detected early, and screening is the only effective way. At present, most of the diabetic patients come to the ophthalmologists only after experiencing considerable vision loss.

Good specialised training of ophthalmologists to diagnose and treat diabetic retinopathy thus becomes a key aspect of blindness prevention. The current need is for a holistic model inculcating awareness creation, community screening, service delivery and training to deal with the problems of diabetes and diabetic retinopathy in the community.

1.1 Information on diabetes

1.1.1. What is diabetes?

Diabetes is a chronic disease that occurs when the pancreas does not produce enough insulin, or alternatively, when the body cannot effectively use the insulin it produces. Insulin is a hormone that regulates blood sugar. Hyperglycaemia, or raised blood sugar, is a common effect of uncontrolled diabetes and over time leads to serious damage to many of the body's systems, especially the nerves and blood vessels.

- Type 1 diabetes (previously known as insulin-dependent or childhood-onset) is characterised

by a lack of insulin production. Without daily administration of insulin, Type 1 diabetes is rapidly fatal.

- Symptoms include excessive excretion of urine (polyuria), thirst (polydipsia), constant hunger, weight loss, vision changes and fatigue. These symptoms may occur suddenly.
- Type 2 diabetes (formerly called non-insulin-dependent or adult-onset) results from the body's ineffective use of insulin. Type 2 diabetes comprises 90% of people with diabetes around the world, and is largely the result of excess body weight and physical inactivity.
 - Symptoms are similar to those of Type 1 diabetes, but are often less marked. As a result, the disease is generally diagnosed several years after onset, once complications have already arisen.
 - Until recently, this type of diabetes was seen only in adults but it is now also occurring in obese children.

- Gestational diabetes is hyperglycaemia which is first recognised during pregnancy.

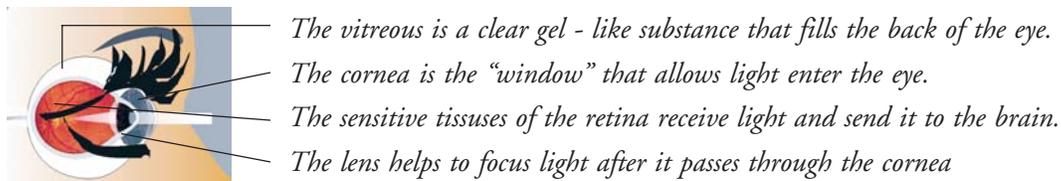
- Symptoms of gestational diabetes are similar to Type 2 diabetes. Gestational diabetes is most often diagnosed through prenatal screening, rather than reported symptoms.

Impaired Glucose Tolerance (IGT) and Impaired Fasting Glycaemia (IFG) are intermediate conditions in the transition between normality and diabetes. People with IGT or IFG are at high risk of progressing to type 2 diabetes, although this is not inevitable.

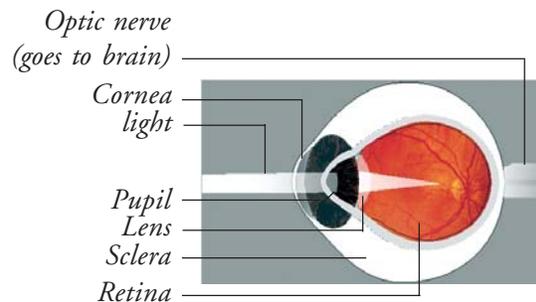
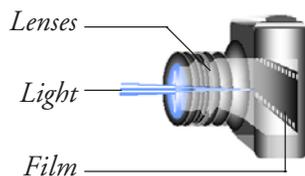
Source: WHO Fact sheet N°312 September 2006

1.1.2 Criteria for the diagnosis of diabetes mellitus

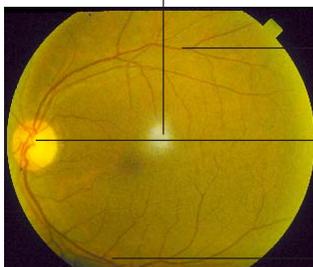
1. Symptoms of diabetes plus casual plasma glucose concentration = 200mg/dl (11.1 mmol/l) Casual is defined as any time of day without regard to time since last meal. The classic symptoms of diabetes include polyuria, polydipsia, and unexplained weight loss.



The eye works in much the same way as a camera



A Healthy Retina



- The Eye*
- The macula is responsible for sharp, central vision
 - The retina is nourished by healthy blood vessels which bring nutrients and oxygen
 - The optic nerve carries impulses to the brain where they are converted into visual images
 - The periphery or outer part of the retina is responsible for peripheral vision

2. FPG = 126mg/dl (7.0 mmol/l). Fasting is defined as no caloric intake for at least 8 h.
3. 2- h PG = 200mg/dl (11.1 mmol/l) during an OGTT. The test should be performed as described by WHO (2), using a glucose load containing the equivalent of 75g anhydrous glucose dissolved in water.

In the absence of unequivocal hyperglycemia with acute metabolic decompensation, these criteria should be confirmed by testing on a different day. The third measure (OGTT) is not recommended for routine clinical use.

Source: Diabetes care, volume 25, Supplement1, January 2002

1.2. Diabetes and human body

1.2.1. What are common consequences of diabetes?

Over time, diabetes can damage the heart, blood vessels, eyes, kidneys, and nerves.

- Diabetic retinopathy is an important cause of blindness, and occurs as a result of long-term accumulated damage to the small blood vessels in the retina. After 15 years of diabetes, approximately 2% of people become blind, and about 10% develop severe visual impairment.
- Diabetic neuropathy is damage to the nerves as a result of diabetes, and affects up to 50% of people with diabetes. Although many different problems can occur as a result of diabetic neuropathy, common symptoms are tingling, pain, numbness, or weakness in the feet and hands.

- Combined with reduced blood flow, neuropathy in the feet increases the chance of foot ulcers and eventual limb amputation.
- Diabetes is among the leading causes of kidney failure. 10-20% of people with diabetes die of kidney failure.
- Diabetes increases the risk of heart disease and stroke. 50% of people with diabetes die of cardiovascular disease (primarily heart disease and stroke).
- The overall risk of dying among people with diabetes is at least double the risk of their peers without diabetes.

Source: WHO Fact sheet N°312 September 2006

1.3. Diabetes and the Eye

1.3.1. The Normal Eye

The human eye is the smallest, yet the most detailed and complex organ.

The delicate retinal tissues of the eye convert light into impulses. These impulses are carried to the brain, which converts them into visual images.

Different parts of the retina such as the periphery, macula, blood vessels and the optic nerve are responsible for different aspects of vision.

1.3.2. What is diabetic retinopathy?

Diabetes causes weakening of the blood vessels in the body. The tiny, delicate retinal blood vessels are particularly susceptible. This weakening of retinal blood vessels, accompanied by structural changes in the retina, is termed as diabetic retinopathy. In diabetic



Haemorrhage

The macula may become damaged if blood vessels weaken near the fovea. Central vision will be reduced due to leakage of fluid, exudates blood in the macula

The impulses sent by the optic nerve may be distorted due to deterioration of blood vessels in the retina

Blood vessels which deteriorate cannot adequately nourish the retina, which in turn will stimulate the growth of new vessels.

Exudates

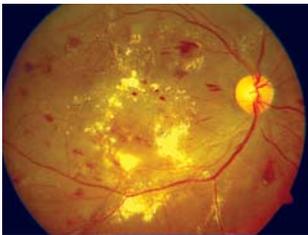
retinopathy, the retinal blood vessels may go through a series of changes such as leakage or closure. These changes may progress from one stage to the next.

1.3.3. Types of diabetic retinopathy

There are two main categories of diabetic retinopathy:

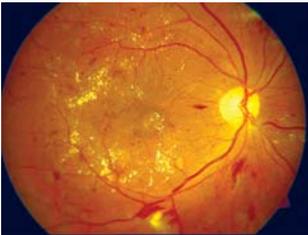
Nonproliferative diabetic retinopathy (when the blood vessels leak and then close), and proliferative diabetic retinopathy (when new blood vessels grow or proliferate).

1.3.4. Non Proliferative Diabetic Retinopathy (NPDR)



Macular edema

There is swelling and fluid accumulation in the fovea



Diffuse leakage

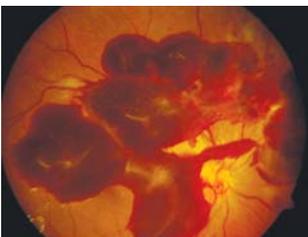
Swelling is caused by scattered leakage throughout the macula

In nonproliferative diabetic retinopathy (also called background retinopathy), the retina may contain



Proliferative

New vessels which are weaker than normal vessels will replace the vessels that are closed up



Severe bleeding

New blood vessels rupture and bleed into the retina and the vitreous, with its attendant complications

capillary leakage, capillary closure, or a combination of the two.

1.3.5. Proliferative Diabetic Retinopathy (PDR)

Progression to proliferative retinopathy is common in longstanding diabetes. Besides having non-proliferative retinopathy, there may be vessels growing on the retina, and the complications that stem from that condition.

1.3.6. Risk factors for diabetes (and therefore diabetic retinopathy) include

- Obesity (more than 20% heavier than your ideal body weight)
- A family history of diabetes
- Hypertension (blood pressure of 140/90 or higher)
- Having a high density lipoprotein (HDL or "good cholesterol") reading of 35 mg/dL or lower
- Elevated triglyceride levels (250 mg/dL or higher)
- Having been diagnosed with gestational diabetes during a pregnancy or having given birth to a baby weighing 9 pounds or more
- Being a member of a high risk ethnic group (Type 2 diabetes is more common among Native Americans, African Americans, and Hispanic Americans)

1.3.7. What are the symptoms of diabetic retinopathy?

Diabetic retinopathy often has no early warning signs. There is no pain, and vision may remain unaffected until the disease becomes severe.

If leaking blood vessels cause swelling of the macula (called macular edema), central vision will become blurred, making it hard to see clearly when driving or reading. Vision may get better or worse during the day, depending on the degree of edema.

If leaking blood vessels cause bleeding in the eye, symptoms will vary based on how much blood is involved. With relatively limited bleeding, the visual

disturbance may appear as spots floating in your visual field. These spots may go away after a few hours.

If bleeding is more severe, vision may suddenly become severely clouded. This can occur overnight during sleep. It may take months for the blood to clear from the eye, or it may not clear at all.

Source: Ed. note: For more information about diabetes, visit the National Diabetes Information Clearinghouse (NDIC) website at <http://diabetes.niddk.nih.gov/index.htm>.

1.4. Eye evaluation in diabetic retinopathy

Diabetic retinopathy progresses rapidly without much warning. Hence periodic eye examination is the only way to monitor the progression of disease and tackle vision threatening problems before further damage occurs.

1.4.1. Recording patient's history

The onset of diabetic retinopathy is related to the duration of diabetes. Hence the ophthalmologist asks the patient about the duration and family history of diabetes. Any history of eye problems is also investigated.

1.4.2. Vision

The goal of the eye examination is to evaluate and improve vision, if possible.

1.4.3. Diagnosing diabetic retinopathy

Diagnostic tools such as a slit lamp, ultra sound and procedures like fluorescein angiography are used, in addition to an ophthalmoscope to assess whether a patient has diabetic retinopathy or other eye problems.

1.4.4. Fluorescein angiography

This is a magnified photography of the retina involving the use of an injectable dye. It helps to classify the condition and to record changes in the retinal blood vessels. The first angiogram is usually done during the first evaluation. Subsequent angiograms may be done to assess the progression of

diabetic retinopathy and to decide on the mode of treatment.

1.4.5. Treatment of diabetic retinopathy

Lasers are widely used in treating diabetic retinopathy. This treatment can slow down the progression of diabetic retinopathy and can stabilize vision. Research in developed countries has established that laser is the only treatment for diabetic retinopathy. No medical treatment is available for retinopathy, other than good blood glucose control. Laser is an intense and highly energetic beam of light that emerges from a light source and is focused on the retina. Absorption by the retina will either seal or destroy the abnormal vessels.

1.4.6. Patterns of laser treatment

Laser treatment reduces swelling by sealing the weak leaking vessels in the retina. It also regresses the new vessels and hence prevents or stops bleeding.

1.4.7. Laser treatment in diabetic retinopathy is of three types

1. Focal treatment
2. Grid treatment
3. Panretinal treatment

1.5. The laser experience

Laser treatment is usually done in an out-patient setting. The patient is given topical anesthesia to prevent any discomfort. The patient is positioned before a slit lamp. The ophthalmologist guides the



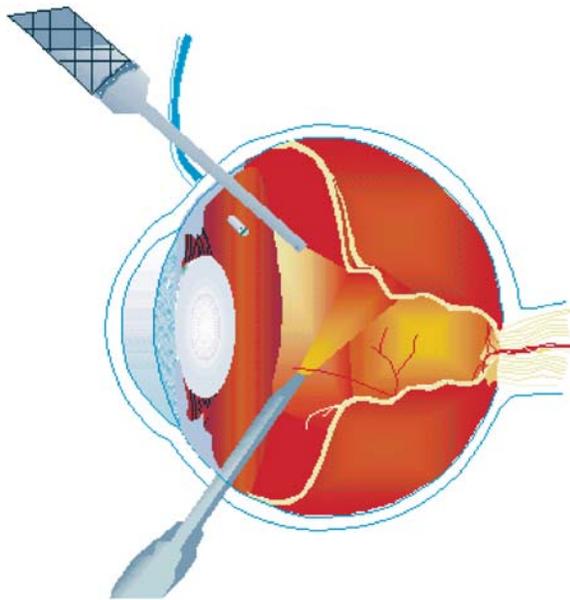
laser beam precisely on the target, with the aid of a slit lamp and a special contact lens. Additional treatment may be required, depending on the patient's condition. Lasers are also delivered through an indirect ophthalmoscope.

1.5.1. Side effects

Some patients experience side effects after laser treatment. These are usually temporary. Possible side effects include watering of eyes, dilated pupils, mild headache, double vision, pain and mild blurring of vision. If these side effects persist or worsen, one should contact an ophthalmologist immediately.

1.6. Vitrectomy

In some patients, there may be bleeding into the vitreous or the vitreous may pull on the retina reducing vision severely. In such instances a vitrectomy (removal of the vitreous) is the choice of treatment. A vitrectomy is done only after other forms of treatment have been tried and failed to control the progression of disease or progression of visual loss.



Source: Aravind DR project Booklet on Management of Diabetic Retinopathy

1.7. Instructions to diabetic patients

1. Diabetes affects brain, heart, kidneys and eyes.
2. Diabetic patients are thrice as likely to develop eye problems than nondiabetic patients
3. The most common complication is diabetic retinopathy involving the blood vessels of the retina.
4. Dilated eye examination by eye doctors detects blood vessel changes in the retina directly. It is an indicator of similar changes occurring in the brain, heart and kidneys.
5. The onset of diabetic retinopathy is related to duration of diabetes.
6. 70-80% of diabetic patients will develop DR in 25 yrs.
7. The risk of blindness is 25 times higher in diabetic patients
8. Diabetic retinopathy is often symptomless until deterioration of vision occurs
9. Early detection and laser treatment for diabetic retinopathy significantly reduces risk of visual loss.
10. Laser treatment will help to retain the existing vision at the most and will not help to regain lost vision
11. All diabetic patients should have periodic examinations by an eye doctor to prevent loss of vision due to diabetic retinopathy.

Frequently asked questions (FAQ)

Q. How is diabetic retinopathy detected?

Doctor advises or performs certain tests to checkup your eyes. These include:

- Visual acuity (sharpness of vision) test - This eye chart test measures to see how well we see small and large objects at various distances.
- Ophthalmoscopy - examination of the eye with a fundoscope after pupil dilation. The doctor puts some medicine in the eye to widen the pupil which is the central hole in the iris or curtain of the eye, so that he can look for signs of diabetic

retinopathy more clearly. He looks for changes in shape, thickness and distribution of blood vessels in the eye, or, for presence of any leaking blood vessels; swelling of the retina in general and of the macula (a special portion for sharp vision) in particular (macular oedema); exudates - pale, fatty deposits on the retina - sign of leaking blood vessels

- Tonometry - A test that determines the fluid pressure in the eye to look for glaucoma

Q. How is diabetic retinopathy treated?

The best solution is to avoid retinopathy by proper diabetes control. Depending on the severity, grade and nature of the problem there are two treatments for diabetic retinopathy. They are both very effective in reducing vision loss.

- Laser Surgery - Doctors perform laser surgery to burn off bleeding new blood vessels around the macula to save vision.
- Vitrectomy - Vitreoretinal surgery is done to restore lost vision caused by a vitreous bleed or opacity.

Q. What complications take place in the eyes due to diabetes?

A Corneal erosion - Cornea, the central transparent portion in the front part of the eye can develop ulcer or erosion that may heal with difficulty and lead to corneal opacity and blindness requiring corneal transplant

- Cataract - Partial or complete opacity of the lens of the eye initially causes blurred vision, and later blindness
- Changing power of spectacles due to change in size of the lens caused by fluid accumulation
- Bleeding in the vitreous, macular swelling, retinal hemorrhage, retinal exudates, retinal detachment - all causing blindness
- Double vision due to nerve damage and paralysis of muscles that make the eyes move upwards, sideways and obliquely.

Q. How does one prevent further complications of the eye due to diabetes?

- Ensure good control of blood sugar and blood pressure to avoid further progression of eye disease. Prevention is better than cure. Quit smoking if a smoker. Ensure regular and proper check ups.
- Children above 10 years and adults below 29 years should get their eyes tested within 3-5 years of diagnosis of diabetes and then tested once a year.
- Adults above 30 years should get their eyes tested at the time of diagnosis of diabetes and then once a year.
- Women in prediabetic state should get their eyes tested prior to becoming pregnant and then in the 1st trimester of pregnancy.
- Those already diagnosed with abnormal findings of the eyes need to be tested more frequently.

Source: www.worlddiabetesfoundation.org

CHAPTER 2

Magnitude of Diabetes and Diabetic Retinopathy

Diabetes mellitus currently affects more than 170 million persons worldwide and will affect an estimated 366 million by 2030, with the most rapid growth in low and middle-income countries, among populations of working age. More than 75% of patients who have diabetes mellitus for more than 20 years will have some form of diabetic retinopathy.

Diabetic retinopathy is a microvascular complication of both type 1 and type 2 diabetes

mellitus. The condition is a leading cause of new-onset blindness in many industrialised countries and is an increasingly more frequent cause of blindness elsewhere. WHO has estimated that diabetic retinopathy is responsible for 4.8% of the 37 million cases of blindness throughout the world.

Source: Prevention of blindness from diabetes mellitus – Report of WHO consultation in Geneva, Switzerland, 9-11 November 2005

Global prevalence of diabetes mellitus – WHO projection on diabetes

| Prevalence data on WORLD | | | | | | |
|--------------------------|----------------------|-------------------------------|------------------------|----------------------|----------------------------|------------------------|
| | 2000 (Population) | 2000 (No. of Diabetics) | 2000 (Prevalence %) | 2030 (Population) | 2030 (No. of Diabetics) | 2030 (Prevalence %) |
| World | 6,081,527,896 | 171,000,000 | 2.8% | 8,206,457,382 | 366,000,000 | 4.5% |

| Prevalence data on WHO South-East Asia Region | | | | | | |
|---|----------------------|----------------------------|------------------------|----------------------|----------------------------|------------------------|
| Country | 2000 (Population) | 2000 (No. of Diabetics) | 2000 (Prevalence %) | 2030 (Population) | 2030 (No. of Diabetics) | 2030 (Prevalence %) |
| Bangladesh | 130,406,594 | 3,196,000 | 2.5% | 219,635,970 | 11,140,000 | 5.1% |
| Bhutan | 2,005,222 | 35,000 | 1.7% | 3,577,325 | 109,000 | 3.0% |
| North Korea | 21647682 | 367,000 | 1.7% | 26214884 | 635,000 | 2.4% |
| India | 1,002,708,291 | 31,705,000 | 3.2% | 1,420,769,842 | 79,441,000 | 5.6% |
| Indonesia | 224,138,438 | 8,426,000 | 3.8% | 311,323,679 | 21,257,000 | 6.8% |
| Maldives | 301,475 | 6,000 | 2.0% | 618,167 | 25,000 | 4.0% |
| Myanmar | 44,702,243 | 543,000 | 1.2% | 53,377,325 | 1,330,000 | 2.5% |
| Nepal | 24,702,119 | 436,000 | 1.8% | 42,839,465 | 1,328,000 | 3.1% |
| Sri Lanka | 19,238,575 | 653,000 | 3.4% | 22,937,028 | 1,537,000 | 6.7% |
| Thailand | 61,862,928 | 1,536,000 | 2.5% | 71,143,362 | 2,739,000 | 3.8% |
| Total | 1,531,713,567 | 46,903,000 | 3.1% | 2,172,437,047 | 119,541,000 | 5.5% |

Source: U.S. Census of Bureau

<http://www.census.gov/ipc/www/idbsprd.html>

Epidemiology of diabetes mellitus

| Year | Author | Place | Age in years | Prevalence | |
|------|---------------------|-------------|--------------|------------|-------|
| | | | | Urban | Rural |
| 1984 | Murthy et al | Tenali | >15 | - | 4.7 |
| 1986 | Patel | Bhardan | >10 | - | 3.8 |
| 1988 | Ramachandran et al | Kudermukh | 20 and above | 5.0 | - |
| 1992 | Ramachandran et al | Madras | 20 and above | 8.2 | - |
| 1998 | ACES | Tirunelveli | 40 and above | - | 5.91 |
| 2000 | Ramachandran et al | Madras | 20 and above | 14.2 | - |
| 2001 | Mohan et al (NUDS) | National | 20 and above | 12.1 | - |
| 2004 | Mohan et al (CURES) | Madras | 20 and above | 14.3 | - |

2.1. Why diabetes and DR?

- Diabetes is a silent epidemic that claims as many lives each year as HIV/AIDS. In 2007, diabetes is estimated to cause 3.5 million deaths globally.
- If present trends persist, by 2025 the majority of people with diabetes in the developing countries will be in the 45-64 age group.
- Prevalence of diabetes is increasing due to change in lifestyles and food practices.
- There are about 39 million people with diabetes in India.
- Increasing prevalence and incidence of diabetes with increase in life expectancy leading to DR.
- DR is one of the most frequent causes of blindness among adults aged 20-74
- DR is often symptomless until visual loss develops
- Prevention, identification and treatment of DR are needed at the earliest to prevent vision loss.

Evidence base for prevalence of diabetic retinopathy in India

Study 1

| | |
|--------------------|--|
| Title of the study | Diabetic retinopathy at the time of diagnosis of noninsulin dependent diabetes Mellitus (NIDDM) in South Indian subjects - M.Reman, M.Ponnaiya, V.Mohan Diabetes Research and clinical practice 34 (1996) Page:29-36 |
| Aim/objective | To evaluate the prevalence of retinopathy at diagnosis of diabetes in south Indian NIDDM and also to make an estimate of the duration of undiagnosed diabetes |
| Methods | 1000 study subjects were chosen from the outpatient clinic of diabetes research centre and M.V. Hospital for diabetes. The assessment included detailed fundus examination by binocular indirect ophthalmoscopy after full mydriasis by the ophthalmologist. |
| Prevalence of DR | 24% |

Study 2

| | |
|--------------------|---|
| Title of the study | Population based assessment of diabetic retinopathy in an urban population in southern India - Lalit Dandona, Rakhi Dandona, Thomas J, Naduvilath, Catherine A Mc Carty, Gullapalli N Rao Br J Ophthalmol 1999, 83:937-940 |
| Aim/objective | To assess the prevalence of diabetic retinopathy and the visual impairment caused by it in an urban population in southern India in order to determine its public health significance. |
| Methods | 2532 subjects, a representative sample of the population of Hyderabad city in southern India, underwent interview and detailed eye examination (dilatation of pupil, stereoscopic fundus examination at slit lamp using 78 dioptre lens and with the indirect ophthalmoscopic using 20 D lens) under Andhra Pradesh Eye Disease Study (APEDS) |
| Prevalence of DR | 22.4% |

Study 3

| | |
|--------------------|---|
| Title of the study | Prevalence of retinopathy at diagnosis among type 2 diabetic patients attending a diabetic centre in south India - Mohan Rema, Raj Deepa, Viswanathan, Mohan Br J Ophthalmol 2000; 84: 1058-1060 |
| Aim/objective | To assess the prevalence of retinopathy in newly diagnosed south Indian type 2 diabetic patients attending a diabetic centre |
| Methods | 448 consecutive newly diagnosed type 2 diabetic patients attending a private clinic. Four field retinal colour photography was performed and graded using a modified form of the ETDRS study grading system |
| Prevalence of DR | 7.3% |

Study 4

| | |
|--------------------|--|
| Title of the study | Diabetic retinopathy among self reported diabetics in southern India: a population based assessment - V Narendran, RKJohn, A Reghuram, R D Ravindran, P K Nirmalan, R.D. Thulasiraj Br J Ophthalmol 2001;86: 1014-1018 |
| Aim/objective | To estimate the prevalence of diabetic retinopathy among self reported diabetics in a population of southern India. |
| Methods | Cross sectional sample of subjects aged 50 years and older from Palakkad district of Kerala State. 25 clusters randomly selected out of 1473 clusters. 54,508 randomly selected out of 32,0636. Assessment was done based on self reported history of diabetes/ current use of insulin to control diabetes and eye examination was doing using direct and indirect ophthalmoscopy. |
| Prevalence of DR | DR 26.2 % |

Study 5

| | |
|--------------------|--|
| Title of the study | Prevalence of diabetic retinopathy in urban India: The Chennai Urban Rural Epidemiology study (CURES) Eye Study I - Mohan Rema, Sundaram Premkumar, Balaji Anitha, Raj Deepa, Rajendra Pradeepa and Viswanathan Mohan 1 OVS, July 2005, Vol.46, No.:7 |
| Aim/objective | To assess the prevalence of diabetic retinopathy in type 2 diabetic subjects in urban India using four field stereo colour photography centre |
| Methods | A representative population of Chennai city in South India of individuals > 20 years in age of 26,001 subjects was screened for diabetes. Of the 1529 known diabetic subjects, 1382 participated in the study. All subjects underwent four-field stereo colour photography and graded according to ETDRS criteria. |
| Prevalence of DR | 17.6 % |

Epidemiology survey on diabetes and diabetic retinopathy in Theni District, South India)

| | |
|--------------------|--|
| Title of the study | Prevalence of and risk factors for diabetic retinopathy in the population of over 30 years of age in Theni district of south India (un published) |
| Aim/objective | To assess the prevalence of diabetic retinopathy in type 2 diabetic subjects in urban India using four field stereo colour photography centre |
| Methods | A cross sectional survey covering a population of 80,000 in 53 randomly selected clusters. The required sample of 31,693 people aged 30 years and above enumerated. Pupillary dilatation and fundus photography using non-mydratic fundus camera and direct and indirect ophthalmoscopy. |
| Results | Prevalence of diabetic retinopathy 10.84% |

Classification of diabetic retinopathy among diabetics

| Study | Lalit Dandona | Mohan | Palghat | CURES | Theni survey |
|-------------------|---------------|-------------|--------------|--------------|--------------|
| Classification | 119 | 438 | 260 | 1715 | 2802 |
| None | 76.5% | 2.7% | 73.8% | 82.4% | 89.5% |
| Mild & Moderate | | | | | |
| NPDR | 21.0% | 6.0% | 23.5% | 16.3 % | 8.1% |
| Severe NPDR | 1.7% | 1.0% | 1.2% | 0.3 % | 1.3% |
| PDR | 0.8% | 0.3% | 1.5% | 0.9% | 1.1% |
| Total DR % | 23.5% | 7.3% | 26.2% | 17.6% | 10.5% |
| CSME | 14.3% | 0 | 7.7% | 2.4% | 3% |

Estimated Prevalence of Diabetes and DR in India

State/UT wise Distribution of Population, Prevalence of Diabetes and DR according to Projection population for 2007

| SI. No. | State/Ut | Population projection for Year 2007 | Prevalence of Diabetes (4%) | Prevalence of DR (11%) |
|---------|----------------------|-------------------------------------|-----------------------------|------------------------|
| 1 | 2 | 3 | 4 | 5 |
| | India* | 1,128,521,000 | 45,140,840 | 4,965,492 |
| 1 | Jammu & Kashmir | 11,099,000 | 443,960 | 48,836 |
| 2 | Himachal Pradesh | 6,526,000 | 261,040 | 28,714 |
| 3 | Punjab | 26,391,000 | 1,055,640 | 116,120 |
| 4 | Chandigarh | 1,161,000 | 46,440 | 5,108 |
| 5 | Uttaranchal | 9,365,000 | 374,600 | 41,206 |
| 6 | Haryana | 23,743,000 | 949,720 | 104,469 |
| 7 | Delhi | 16,484,000 | 659,360 | 72,530 |
| 8 | Rajasthan | 63,408,000 | 2,536,320 | 278,995 |
| 9 | Uttar Pradesh | 186,755,000 | 7,470,200 | 821,722 |
| 10 | Bihar | 92,208,000 | 3,688,320 | 405,715 |
| 11 | Sikkim | 583,000 | 23,320 | 2,565 |
| 12 | Arunachal Pradesh | 1,184,000 | 47,360 | 5,210 |
| 13 | Nagaland | 2,145,000 | 85,800 | 9,438 |
| 14 | Manipur* | 2,336,000 | 93,440 | 10,278 |
| 15 | Mizoram | 958,000 | 38,320 | 4,215 |
| 16 | Tripura | 3,449,000 | 137,960 | 15,176 |
| 17 | Meghalaya | 2,500,000 | 100,000 | 11,000 |
| 18 | Assam | 29,053,000 | 1,162,120 | 127,833 |
| 19 | West Bengal | 86,125,000 | 3,445,000 | 378,950 |
| 20 | Jharkhand | 29,745,000 | 1,189,800 | 130,878 |
| 21 | Orissa | 39,276,000 | 1,571,040 | 172,814 |
| 22 | Chhattisgarh | 22,934,000 | 917,360 | 100,910 |
| 23 | Madhya Pradesh | 67,569,000 | 2,702,760 | 297,304 |
| 24 | Gujarat | 55,808,000 | 2,232,320 | 245,555 |
| 25 | Daman & Diu | 227,000 | 9,080 | 999 |
| 26 | Dadra & Nagar Haveli | 281,000 | 11,240 | 1,236 |
| 27 | Maharashtra | 106,386,000 | 4,255,440 | 468,098 |

| SI. No. | State/Ut | Population projection for Year 2007 | Prevalence of Diabetes (4%) | Prevalence of DR (11%) |
|---------|---------------------------|-------------------------------------|-----------------------------|------------------------|
| 28 | Andhra Pradesh | 81,554,000 | 3,262,160 | 358,838 |
| 29 | Karnataka | 56,909,000 | 2,276,360 | 250,400 |
| 30 | Goa | 1,540,000 | 61,600 | 6,776 |
| 31 | Lakshadweep | 73,000 | 2,920 | 321 |
| 32 | Kerala | 33,535,000 | 1,341,400 | 147,554 |
| 33 | Tamil Nadu | 65,629,000 | 2,625,160 | 288,768 |
| 34 | Pondicherry | 1,146,000 | 45,840 | 5,042 |
| 35 | Andaman & Nicobar Islands | 434,000 | 17,360 | 1,910 |

Source for population projection: Registrar General of India

2.2. DR magnitude estimation tool

Objectives of the Tool

- Calculation of the magnitude of Diabetic Retinopathy in the service area
- Estimation of annual, daily work load potential for out patient (diabetics) in the retina clinic
- Estimation of annual, daily work load potential for laser procedures in the retina clinic

Diabetic retinopathy workload estimation

| | 2000 | | 2030 | |
|---------------------------------------|-------|-----------|-------|-----------|
| | Rate | Persons | Rate | Persons |
| Service area population | | 1,000,000 | | 1,000,000 |
| No. of Persons with Diabetes | 3.2% | 32,000 | 5.6% | 56,000 |
| DR amongst the diabetics | 20.0% | 6,400 | 20.0% | 11,200 |
| Laser Treatment amongst those with DR | 20.0% | 1,280 | 20.0% | 2,240 |

Annual & Daily workload Estimation

No. of working days/year:

300

| | Frequency once in | Total Patients | Daily load | Total Patients | Daily load |
|--|-------------------|----------------|------------|----------------|------------|
| Routine Hospital Examination of Diabetics for DR: | 1 Year | 25,600 | 85 | 44,800 | 149 |
| Routine Hospital Examination of DR Patients: | 6 Months | 12,800 | 43 | 22,400 | 75 |
| Total out-patient examinations | | 38,400 | 128 | 67,400 | 224 |
| | Rate | No. of Eyes | | No. of Eyes | |
| Laser Procedure(eyes) incidence as a % of the backlog of DR Laser Patients | 20% | 512 | 2 | 869 | 3 |
| Number of treatment sessions | 3 | 1,536 | 5 | 2,688 | 9 |

CHAPTER 3

Disease Control

3.1. Primary level: screening only

At the primary level, the screening is done for diabetes and diabetic retinopathy. The principal goal of primary care is to decrease the incidence of preventable eye diseases and vision impairment. The primary levels services include the case identification and referral to secondary level centre.

3.2. Secondary level: Medical

Secondary level eye care centre provides facilities for investigations and medical treatment (laser treatment) for diabetic retinopathy.

3.3. Tertiary level: Surgical

Tertiary level eye care centre provides all type of investigations and treatment for diabetic retinopathy including laser and surgery.

3.4. A. Detection (Primary, Secondary and Tertiary)

Screening of general population and detection of diabetic retinopathy in the diabetic population is the first step in management of diabetic retinopathy. The screening of the diabetic population is performed essentially by the review of medical history, and by blood sugar estimation. The detection of retinopathy is only by examination of the ocular fundi. This procedure can be done at primary, secondary, and tertiary care levels by using the available resources optimally.

3.4. 1. Primary level services

- This level includes physicians, diabetologists, general ophthalmologists and vision centers
- Focus is on only basic screening of the diabetics for diabetic retinopathy

- To increase awareness about the diabetic eye complications to this group and to the diabetic patients coming to them
- Network with ophthalmologist for referral of all diabetic patients

3.4.2. Strategies

1. The first contact for diabetic patients is their family physician/General Physician, Diabetologist or Primary Health Centre (PHC). The General physicians/ diabetologists need to have short term training on the use of direct ophthalmoscope for 2 hours at a secondary or tertiary hospital.
2. Conduct seminars for physicians and diabetologists on diabetic eye complications with focus on eye screening and its importance.
3. Display awareness posters at the PHCs, Diabetologist's Clinic, hospitals etc.,
4. Identify the diabetic patients in the Primary Health Centres (PHCs) during drug distribution day and motivate them to attend the diabetic retinopathy screening camp
5. Organise health education programme in the community. The target groups include Diabetic patients, family members of diabetics, Teachers, Religious and other community leaders, other NGO,s working in other fields.
6. Organise screening camps in association with local agencies/local diabetologist for screening the diabetic patients for DR in the community.
7. The technician at the vision centre is to perform the following activities
 - a. Conduct screening for diabetes for all persons over the age of 30 kg using the fasting blood glucose test

- b. Organise a diabetic retinopathy screening camp in the vision centre once a year
 - c. Give patient counselling and health education to diabetic patients during regular eye examination
 - d. Refer diabetic retinopathy patients to the secondary level and tertiary care services for further investigations and treatment.
3. Human resource development
 - a. Training and support of primary level health workers
 - b. Training of trainers for the primary level
 4. Documentation
 - a. Maintain good documentation to understand magnitude of services needed

3.4.3. Secondary level services

The role of the secondary level in control of diabetic retinopathy includes

- Screening, diagnosis, disease management, follow-up and prevention
- Human resource development, health education, and documentation.

3.4.4. Strategies

1. Screening, diagnosis and disease management
 - a. Developing screening programmes with equipment to do investigations such as FFA and USG (Optional)
 - b. Providing treatment for diabetic retinopathy with lasers and other medical treatment
2. Health education
 - a. Development and production of health education materials for use at secondary and primary levels.
 - b. Conduct seminars for the physicians and diabetologists on diabetic eye complications with focus on eye screening and its importance.
 - c. Display awareness posters at the PHCs, diabetologist's clinic, hospitals etc.,
 - d. Organise seminars for the paramedical personnel and non-governmental organisations, senior citizens, government employee associations, banks, medical shop owners, lab owners, etc.,
 - e. Organise patients' and doctors' interaction meetings

3.4.5. Tertiary level services

Tertiary level services include the provision of retina and vitreous services including medical and surgical management, human resource development, and research.

Strategies

1. Diagnosis and disease management
 - a. Investigations for diabetic retinopathy
 - b. Fluorescein angiography
 - c. photography-scan ultrasonography
 - d. Lasers for diabetic retinopathy
2. Vitreo-retinal Surgical management
3. Health education
 - a. Development and production of Health education materials for use at secondary and primary levels.
 - b. Organisation of seminars for the physicians and diabetologists on diabetic eye complications with a focus on eye screening and its importance.
 - c. Display of awareness posters at the PHCs, diabetologist's clinic, hospitals etc.,
 - d. Conduct seminars for the paramedical personnel and non-governmental organisations, senior citizens, government Employee associations, banks, medical shop owners, lab owners, etc.,
 - e. Organise patients' and doctors' interaction meetings.
3. Human resource development
 - a. Train of ophthalmologists and trainer of trainers in managing diabetic retinopathy

- b. Train of physicians in diagnosing diabetic retinopathy
 - c. Train of ophthalmic technician for fundus photography
4. Research
- a. Population based research on magnitude, risk factors, accessibility and utilisation of health services
 - b. Clinical research on risk factors, when to treat, when to follow up and new treatment modalities etc.,

3.5. Activity plan for screening and detection at primary, secondary and tertiary care

| | Primary care | Secondary care | Tertiary care |
|-------------------------------|--------------|----------------|---------------|
| Diabetes screening | | | |
| History | + | + | + |
| Blood test | + | + | + |
| Examination (includes eye) | + | + | + |
| Retinopathy screening | | | |
| Dilated eye examination | + | + | + |
| Ophthalmoscopy | + | + | + |
| Bio-microscopy& angiography | + | + | |
| Other detailed examination | - | - | + |

The ideal method of mass population based screening is by wide-angle fundus photography of all individuals above 30 years of age, and other individuals with a positive history of diabetes.

3.5.1. Treatment at primary, secondary and tertiary level

The treatment of diabetic retinopathy depends on the stage of diabetes. The prospective randomised controlled clinical trials (diabetic retinopathy study-DRS; and early treatment diabetic retinopathy study-ETDRS) have conclusively demonstrated that early treatment both in non-proliferative and proliferative stage of retinopathy helps reduce the blindness significantly. The diabetic vitrectomy study- DRVS has demonstrated that vitrectomy in the advanced stage of diabetic retinopathy helps restore vision. Thus, the treatment of diabetic retinopathy is essentially by laser photocoagulation in early stage of

retinopathy, and by vitrectomy in the late stage of the disease.

Activity plan for treatment

| Retinopathy Treatment | Primary Care | Secondary Care | Tertiary Care |
|-----------------------|--------------|----------------|---------------|
| Laser- macula | | + | + |
| Laser - scatter | | + | + |
| Vitrectomy | | | + |

Activity plan for referral, follow-up and data base

| Retinopathy Treatment | Primary Care | Secondary Care | Tertiary Care |
|-----------------------|--------------|----------------|---------------|
| Referral | + | + | |
| Follow-up | + | + | + |
| Date base | + | + | + |

CHAPTER 4

Human Resource Development

Human Resource Development at Primary, Secondary and Tertiary level: The human resources required for timely treatment and follow-up of patients with diabetic retinopathy include diabetologists, ophthalmologist, nurse, technician and counsellor. Currently, there is a scarcity of human resources, and the available resources are unevenly distributed. Additionally, all ophthalmologists are not adequately trained or equipped to treat diabetic retinopathy.

4.1. Human resource requirements at the primary level

| | |
|---------------------------|-----|
| Physician / Diabetologist | - 1 |
| Technician / Optometrists | - 1 |
| Counsellor | - 1 |

4.1.1. Additional skills required

- The General physicians/diabetologist should understand the importance of eye screening in diabetes.
- They can be given short term training on the use of direct ophthalmoscope.

4.1.2. The Technicians at the vision centre

- Need to know what diabetic retinopathy is
- Importance of screening
- Training in use of fundus photography and use of digital camera with slit lamp adapter

4.1.3. The Counsellor at the vision centre

- Training in basic understanding of diabetes and diabetic retinopathy
- Knowledge of how to create awareness about diabetic retinopathy
- Equipped with awareness materials

4.2. Human resources requirements at secondary level

| | |
|----------------------------|-----|
| General ophthalmologist | - 1 |
| Nurse | - 1 |
| Technicians / optometrists | - 1 |
| Field coordinator | - 1 |
| Counsellor | - 1 |

General ophthalmologist

- Diabetic retinopathy
 - Severity levels
 - Treatment indications
 - Follow up schedule
- Need additional skills in indirect ophthalmoscopy, slitlamp bio-microscopy
- Interpretation of Fluorescein angiography.
- Focused training in retinal laser photocoagulation.

Nurse

- Assist in conducting diagnosis and examination of patient and preparing them for treatment.
- Attend and assist in diabetic retinopathy screening camps.

Optometrists / Technicians

- Undergo additional training in fundus photography and fluorescein angiography
- FFA - Indications, technique complications
- Basic ultrasonography (optional)

Field coordinator

- Training in basic understanding on diabetes, DR
- Health education methods
- Community outreach camps etc.

Counsellor

- Training in basic understanding of diabetes and diabetic retinopathy
- Should know how to create awareness about diabetic retinopathy
- Develop awareness materials
- Should be able to train primary care health workers

4.3. Human resources requirements at tertiary level

| | |
|--------------------------------------|-----|
| Ophthalmologist | - 2 |
| Medical & surgical retina specialist | - 2 |
| Technicians / optometrists | - 1 |
| Nurse | - 3 |
| Counsellor | - 2 |
| Project manager | - 1 |
| Field coordinator | - 1 |
| Administrative assistant | - 1 |

Ophthalmologist

- Fellowship trained vitreo retina specialist
- Adequate understanding of diabetic retinopathy and its management

- Able to interpret FFA and ultrasonography
- Adequate training in handling laser
- Adequate surgical skills

Project manager

- Adequate understanding of diabetic retinopathy and its management
- Project management capacity to implement the diabetic retinopathy services at the community

Administrative assistant

- Adequate understanding of diabetic retinopathy and its management
- Computer skills to data entry

If adequate man power is available, the following training programmes can be started at the tertiary level

1. Long term fellowship in retina vitreous
2. Long term fellowship in medical retina
3. Short term certificate course in laser in diabetic retinopathy

Human resources requirements

| Human resources | Primary care | Secondary care | Tertiary care |
|---------------------------|--------------|----------------|---------------|
| Ophthalmologist | 0 | 1 | 2 |
| Retina consultant/surgeon | 0 | 0/1 | 2* |
| Nurse | 0 | 1 | 3 |
| Counsellor | 1 | 1 | 2 |
| Technician/optometrist | 1 | 1 | 1 |
| Project manager | 0 | 0 | 1 |
| Field coordinator | 0 | 1 | 1 |
| Administrative assistant | 0 | 0 | 1 |

*** Note:** If the retina outpatient is between 75-100, there should be one fully trained retina vitreous surgeon and one more ophthalmologist with atleast basic training in medical retina.

CHAPTER 5

Infrastructure and Equipment

Infrastructure at Primary, Secondary and Tertiary level: The additional infrastructure beyond that needed for general eye care are provisions for fundus examination, and treatment by laser or vitreous surgery.

5.1. Primary level

- This will include physicians, diabetologists, general ophthalmologists and vision centers
- Focus is on only basic screening of the diabetics for diabetic retinopathy (**Table-1**)

5.2. Secondary level

5.2.1. Activities

- Screening, diagnosis, disease management, follow-up and prevention (**Table-2**)

Screening, diagnosis and disease management

- Screening services
- I/O, S/L Biomicroscopy
- FFA
- USG (Optional)
- Treatment
- Lasers
- Other medical treatment – IVTA, Avastin, etc.

Additional requirements

- This is in addition to that needed for general eye care

Tertiary level

- Exclusive retina and vitreous services including medical and surgical management (**Table-3**).
- Human resource development and research.

Primary level :Table-1 (at vision centre)

| S.No | Category | Make & mode | Unit cost (Rs.) | Total cost (Rs.) |
|------|---|-----------------|-----------------|------------------|
| 1 | 78 D lens - 1 | Volk | 6,500 | 6,500 |
| 2 | Digital camera with Slit lamp adapter - 1 | Aravind model | 15,000 | 15,000 |
| 3 | Direct ophthalmoscope | Heine | 13,000 | 13,000 |
| | Total | | | 34,500 |
| 4 | Nonmydriatic fundus camera (physician's office) | Topcon – NW 200 | 950,000 | Desirable |

Secondary level :Table-2

| S.No | Category | Make & mode | Unit cost (Rs.) | Total cost (Rs.) |
|------|---|--|--------------------------|--------------------------|
| 1 | Indirect ophthalmoscope with 20D lens - 1 | Heine-sigma 150 | 45,000 | 45,000 |
| 2 | 78 D lens - 1 | Volk | 6,500 | 6,500 |
| 3 | Frequency doubled yag laser with endolaser probe/ indirect ophthalmoscope & slit lamp delivery with all accessories - 1 | Irides-gl oculight Carl zeiss-visulas 532 | 1,600,000 (2,000,000) | 1,600,000 (2,000,000) |
| | Total | | | 1,651,500 |

Table-2 Desirable Equipments at secondary level

| S.No | Category | Make & mode | Unit cost (rs) | Total cost (rs) |
|------|--|---|--------------------------|-----------------|
| 1 | FFA including retina camera & imagenet - 1 | Topcon-trc 50 dx Carl zeiss - visu cam light | 1,400,000 (1,200,000) | Desirable |
| 2 | Ultrasonography (A/B scan) | SONOMED Inc USA OTI Canada Scan 200 | 675,000 835,000 | Desirable |
| 3 | Non-mydriatric fundus camera | Topcon – NW 200 | 950,000 | Desirable |

Table-3 Tertiary level

| S.No | Category | Make & mode | Unit cost (rs) | Total cost (rs) |
|------|--|---|--------------------------|--------------------------|
| 1 | Indirect ophthalmoscope with 20D lens - 2 | Hein-sigma 150 | 45,000 | 90,000 |
| 2 | 78D lens - 1 | Volk | 6,500 | 6,500 |
| 3 | FFA including retina camera & imagenet - 1 | Topcon-trc 50 dx Carl zeiss - visu cam light | 1,400,000 (1,200,000) | 1,400,000 (1,200,000) |
| 4 | Frequency doubled yag laser with endolaser probe/indirect ophthalmoscope & slit lamp delivery with all accessories - 1 | Irides-gl oculight Carl zeiss-visulas 532 | 1,600,000 (2,000,000) | 1,600,000 (2,000,000) |
| | Total | | | 3,096,500 |

Table-3 Surgical equipments at tertiary level

| S.No | Category | Make & mode | Unit cost (rs) | Total cost (rs) |
|------|--|--|--------------------------|--------------------------|
| 1. | Vitreotomy console - 1 | Alcon-accrus Iridex inc.USA | 2,400,000 (2,400,000) | 2,400,000 (2,400,000) |
| 2. | VR surgical instruments -1 | Synergetics | 600,000 | 600,000 |
| 3. | Surgical operating microscope with CCTV attachment and observerscope – 1 | Carl zeiss-visu 140/s1 Topcon-oms-800 | 1,700,000 (2,700,000) | 1,700,000 (2,700,000) |

| S.No | Category | Make & mode | Unit cost (rs.) | Remarks |
|------|-------------------------------------|---|------------------------|--------------|
| 1 | Optical Coherence Tomography (OCT) | Carl zeiss – stratus ii Topcon 3d-oct-1000 | 2,400,000 3,400,000 | Nice To Have |
| 2 | Electroretinogram (Multi Focal ERG) | Lkc Inc.Usa | 2,900,000 | Nice To Have |

Surgical

| S.No | Category | Make & mode | Unit cost (rs.) | Remarks |
|------|---|----------------|-----------------|-----------|
| 1 | Attachment for existing surgical operating microscope – visu 140 BIOM | Oculus-Sdi Iii | 700,000 | Desirable |

CHAPTER 6

Health Information for Behavioural Change

6.1. Introduction

A successful program to combat Diabetic Retinopathy in part relies upon the level of awareness of that disease within the community. It appears that awareness of diabetes and Diabetic Retinopathy is relatively low in many parts of India, making it difficult for the individual to engage in preventive actions, diagnosis, or treatment. Providing relevant information is an essential step in conducting a successful Diabetic Retinopathy program. Four aspects of health information for behavioural change outlined here.

6.2. Assessment of existing awareness

One recommended method of assessment is through a study of Knowledge, Attitude, and Practice (KAP) within the community. Knowledge refers to the understanding of Diabetic Retinopathy in the community. Attitude refers to the subjective feelings about Diabetic Retinopathy, practice refers to actions taken within the community with reference to Diabetic Retinopathy.

The first step in preparing a KAP study is identifying the domain or substantive topic to be assessed, which in this case is Diabetic Retinopathy.

The next step is the actual design of the questions for the study. Questions related to knowledge will focus on assessing any base awareness of Diabetic Retinopathy, symptoms, diagnosis, and treatment. Questions related to attitude will focus on how important Diabetic Retinopathy is regarded and beliefs about the disease. Questions related to practice will focus on the intervention and practice patterns within the community. Clearly, there may be different target populations to assess. Useful categorisations of target populations to question are: physician

community, paramedical community and general community.

The third step in preparation is to pre-test the instrument, confirming its validity, repeatability and comprehensibility, through feedback and relevant modification.

The study is then conducted on samples of the target population, chosen to represent the demographic mix of the target area and to contain a sufficient size of respondents to provide valid results. A standard method of conducting the survey, whether in person, by telephone, or by mail, must be chosen for each target group. Choice of the method is determined by the needs, abilities, and accessibility of the target group.

6.3. Guidelines for conducting a knowledge, attitude and practice (KAP) study

Before beginning the process of creating awareness in any given community, it is first necessary to assess the environment in which health information for behavioural change will take place, what people know about certain things, how they feel and also how they behave. Understanding the levels of Knowledge, Attitude and Practice facilitates a more efficient process of health information for behavioural change providing information necessary to tailor the program appropriate to the needs of the community.

Smaller sub-categories created for this study consisted of the medical community (those who are responsible for the provision of medical care in a population, including doctors, paramedics, pharmaceutical providers, and others) and the general community (those who receive care).

The medical community category was further divided into medical practitioners and paramedical

personnel in areas with a large enough population of these two groups. The basis for categorization is that each group has received different levels of medical training and information in the past, making it necessary to tailor health information for behavioural change in these separate categories to attain maximum efficiency.

The first stage in preparing questions for a KAP study is to meet with experts (diabetologist, medical practitioners, eye-care service providers etc.) to identify the endpoints or goals of the health information activities for each target group.

Questions are open-ended, (without multiple-choice answers provided) to avoid guessing that gives a false impression of the level of knowledge. The questions covered the following topics:

- Epidemiology of diabetes
- Progress of diabetes
- Symptoms of diabetes
- Diagnosis of diabetes
- Treatment options for diabetes
- Risk factors for diabetic retinopathy
- Treatment options for diabetic retinopathy
- Service

Questions included in the Attitude section are designed to gauge the prevailing attitudes, beliefs and misconceptions in the population about these diseases. This is most effectively done using a strategy different from that used in the Knowledge section. Statements are provided, and respondents should be asked to indicate the extent to which they agree with those statements, on a pre-determined scale (strongly disagree, moderately disagree, neutral, moderately agree, strongly agree). These questions cover the following topics:

- Demography
- Follow-up procedure and importance
- Importance, significance, and severity of diabetes
- Importance of referral
- Health seeking behaviour

Questions included in the Practice section are designed to assess the practices of the population with regard to these two diseases. These are again open-ended questions; the following topics are covered

- Intervention
- Counselling services
- Referral practices
- Diabetic management
- Continuing Medical Education (CME)

The results of the KAP study are reflective of the questions asked, again emphasising the importance of questionnaire preparation. Once conducted, the results are analysed to look for trends, gaps in knowledge, misconceptions, and adequacy of practice patterns to identify the informational needs of the community and form the basis for the messages delivered (Please refer annexure-1 KAP questionnaire).

6.4. Targeting awareness needs through messages

The results of the KAP study help to identify the gaps in the levels of awareness in the various target groups in the community. For example, Are general members of the community aware of diabetes and Diabetic Retinopathy? Do community members, who may be aware of diabetes, understand the effects of it and know what treatments are available? Does the paramedical community understand the different types of diabetes, the symptoms, and the risk factors for Diabetic Retinopathy? Are target area physicians adequately trained in the risk factors for diabetes and Diabetic Retinopathy or in the most current trends in diagnosis and disease management?

6.5. Guidelines for development of messages

I.E.C. means sharing information and ideas in a way that is culturally acceptable to the community by using appropriate channels, message and methods. It is an important tool in health promotion for creating supportive environment, strengthening community action and changing behaviour.

Mass media reaches millions of people within a short time, and as the adage says, “One picture is worth a thousand words”.

6.6. General approach for development of health education messages

Messages are be tailored for cultural acceptability, literacy levels, available infrastructure, and to the specific target audience, and are delivered by a variety of channels in different forms.

6.6.1. Key messages are

- Simple
- Clear
- Need – Based and Relevant
- Objective and unbiased
- Consistent
- Accurate
- Positive and
- Linked to service delivery

They also

- Provide options, and
- Lead to action

In general terms, there are three categories of strategies¹ for creating awareness, each vary in terms of method of delivery, the target audience, and to some extent are based upon the content of the message. They are:

1. Mass: targeted to communities to create general awareness and knowledge of a topic or event;
2. Group: targeted at smaller audiences to not only add to the knowledge base but to also address attitudes, conceptions, and practice patterns;
3. Individual: targeted at the individual, this is a resource intensive approach that, can modify knowledge, attitudes, and behaviour.

Each strategy is amenable to particular methods of delivery and specific uses of media. The following chart outlines this:

| Approach | Method | Media |
|------------|----------------------|-------------------------------|
| Mass | Press meeting | Radio/television |
| | Public meeting | Poster/banner |
| | Public announcement | Newspaper Exhibition Chart |
| Group | Seminar | Powerpoint |
| | Lecture/presentation | Booklet |
| | Patient Interaction | Pamphlet |
| | Group discussion | |
| Individual | Patient education | Flip chart |
| | Counselling | Leaflet |

6.7. Diabetic retinopathy awareness strategies

Diabetic retinopathy is becoming an increasingly important cause of visual impairment in India.² Vision loss and blindness due to diabetic retinopathy are preventable to a large extent, with early detection and timely treatment³. However, many people with diabetic retinopathy remain completely asymptomatic and unaware that their vision is under threat well beyond the optimal stage of treatment.⁴ A lack of knowledge on the need for screening, especially in the absence of symptoms, is a major barrier to regular screening for many people with diabetes⁵. Awareness that diabetes can cause diabetic retinopathy is present in only 28.8% of the urban population in southern India⁶.

People vary so widely in their socio-economic conditions, traditions, attitudes, beliefs and level of knowledge that uniform communication approach is not viable. A mixture of different approaches are developed depending upon the local circumstances. The broad strategies planned and followed to increase awareness about diabetic retinopathy included advocacy, training of medical practitioners, training of paramedical personnel and other partners including the local community, screening camps, targeted intervention in groups at risk of developing diabetic retinopathy, counselling and research.

6.8. Mass approach

A poor result in the knowledge section of the KAP survey amongst the population studied is a good indication for a high level of effort in the Mass approach to health information for behavioural change.

Press meeting, Training, Health education, Guest Lectures, Public meetings and exhibition part of health information for behavioural change. Messages are disseminated through various means; “Cable TV Telecast, Slides in cinema theatres, message written on walls, motivating medical practitioners to refer diabetic patients to camps, display of posters in different locations, mike announcements and bit notice distribution.”

The main purpose of press meetings is to disseminate information on the management of diabetic retinopathy through frequent write-ups and articles contributed by press members and faculty of eye hospitals; these are published in local newspapers and magazines.

Television and radio announcements, though expensive, may be useful to reach the illiterate in the rural areas; but it should be kept in mind that audio



messages are probably the only source of information for the visually impaired group that we are targeting.

Poster display in hospitals or public meeting places have the same advantage of being widely seen, as well as the additional benefit of more specifically targeting the intended audience. They have displayed in eye hospitals or diabetes clinics, where they are likely to be seen by those who most need to see them.



Pamphlets and Booklets are distributed in the community to spread more specific knowledge (tailored to specific groups of people, and containing information meant specifically for them) about the disease. The information is read by and repeated by those who pick up the information.

Trade exhibitions, local fairs and festivals provide an opportunity to reach a large audience through the use of a booth distributing IEC materials while providing a forum for interaction between knowledgeable project staff and the public.

6.9. Group approach

The group approach, characterised by efforts to reach a smaller target audience for a more sustained period of time, is designed to help change the opinions and



attitudes of the targeted people, assuming that the audience already possesses some level of awareness and some form of basic knowledge of the problem. Orientation training is given through lectures, group discussions and guest lectures.

Orientation training on diabetic retinopathy, its magnitude, signs, symptoms and management is conducted for ophthalmologists, medical practitioners and paramedical personnel

Group discussions are highly effective tools because they facilitate a free flow of ideas in an informal setting, and allow for one-to-one interaction with a knowledgeable person who can answer questions pertaining to the disease. They are conducted during orientation training, teachers' meetings, religious gatherings, support group meetings etc.



Guest lectures offer opportunity to spread knowledge to small groups (selected for a variety of reasons, including being at a high risk for developing diabetes or diabetic retinopathy, or being in a position to effect a positive change in the community). These lectures are given by doctors and project staff, and are designed to educate specific groups on the problems identified by the KAP. Guest lectures are arranged at professional gatherings, medical conferences, diabetic associations, rotary meetings, NGO conferences and similar settings.

Targeted Intervention: Health education training sessions are presentations given to small groups made up of very specific members, typically a group that derive benefit greatly from these sessions, like known diabetics at high-risk for developing diabetic



retinopathy. The 'patient interaction sessions' conduct involve a short presentation on diabetes and diabetic retinopathy, followed by a question and answer session between the audience and the presenter.

6.10. Individual approach

The activities undertaken are designed to change the attitudes and practices of those with mistaken perceptions concerning diabetes and diabetic retinopathy. Although this approach has the greatest possibility of success, it is resource intensive; and it is conducted only after mass and group campaigns. The approach adopted in patient counselling provides specific, detailed information to increase knowledge, change attitudes, or alter incorrect practices. It is the perfect opportunity to transfer health information for behavioural change because of the one-to-one interaction between a counsellor and the patient.

6.11. Counselling

Counselling is a helping relationship between the counsellor and the patient, wherein the counsellor enables the client to make a realistic decision and act on it. Counselling is a helping process aimed at problem solving. Counselling sessions during screening camps and in the base hospital provide a perfect opportunity for awareness creation because of the one-on-one interaction between a counsellor and a patient. This is a good time to provide specific, and detailed information designed to increase knowledge, change attitudes, or alter incorrect practices.



6.12. Periodic evaluation

It is necessary to assess existing awareness and to structure a program which creates it. It is equally necessary to determine if the strategies have been effective in creating increased awareness. Hence, the study instrument, e.g., KAP, must be periodically conducted with the same target population to measure any changes in the level of awareness and provide further insight on the need for additional messages.

6.13. IEC Material

6.13.1. Posters

Posters are intended to raise general awareness in the community about the problem of diabetic retinopathy. They are specifically aimed at raising awareness amongst diabetics. Posters are an effective way to create awareness because many people see them simultaneously when placed in highly visible locations, and they quickly impart knowledge to those who see them. They are placed in areas where diabetics are likely to see them, such as diabetes clinics and waiting rooms in hospitals. In addition, they are also placed in medical shops, eye hospitals, local meeting places, and anywhere else where they are likely to be seen by large numbers of people. Posters are not intended to substantially add to the knowledge of those who see them, but merely to increase awareness about diabetes and diabetic retinopathy. Posters contain:

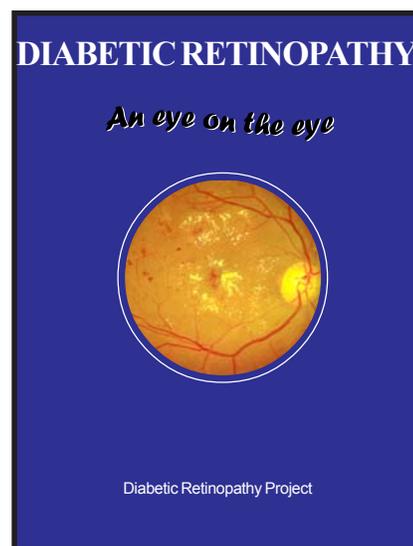
- An eye-catching title such as “Diabetes Affects the Eye” or “Protect your eyes”
- Illustrations depicting the effects of diabetes and diabetic retinopathy on the retina
- Basic information about the nature of diabetic retinopathy and its potential visual implications
- Information about the importance of eye care for diabetics
- Encouragement for diabetics to have their eyes examined regularly

(Please refer Annexure - 2, 2a Posters)



6.13.2. Booklet

To educate medical practitioners and paramedical personnel on the subjects of diabetes and diabetic retinopathy, it is necessary to prepare materials that provide in-depth information about these subjects. This can most effectively be accomplished through the publication and distribution of booklets. These booklets are intended for those with some degree of pre-existing medical knowledge who are in a position to effect significant changes in community health and



therefore require adequate knowledge on these subjects. These booklets contain:

- An overview of the key facts about diabetes and its effects on the eye
- Relevant statistics for diabetics
- An overview of the normal functioning of the eye and illustrations of a healthy retina
- Information on the magnitude of the problem of diabetic retinopathy and other diabetes-related eye diseases
- Specific information about the causes and effects of diabetic retinopathy, including details on its types and symptoms with illustrations of the healthy and affected eyes.
- Information regarding the diagnostic procedure for diabetic retinopathy
- Information regarding treatment options for diabetic retinopathy, including background information on lasers and the vitrectomy procedure, as well as the instances for which each is appropriate
- Information regarding the importance of regular eye examinations and care for diabetics. The ideal follow-up schedule for both diabetics and diabetic pregnant women are also provided.

6.13.3. Pamphlet

Diabetes and the Eye



ARAVIND
the service for sight

Pamphlets are an ideal way to educate diabetics on the nature and significance of diabetic retinopathy. They provide basic information about the disease so as to ensure that diabetics understand the importance of regular eye care and engage in health seeking behavior. Pamphlets are made available at PHCs, eye service centers, diabetes clinics and labs, and with medical practitioners and paramedical personnel to effectively spread

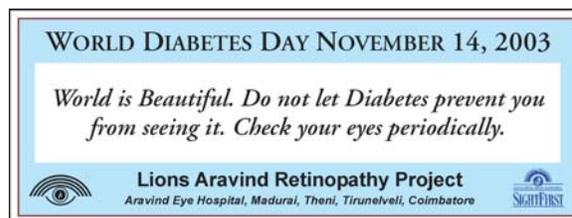
knowledge in this critical aspect. Information in these pamphlets should be in an easily understandable format that can impart basic knowledge without being so in-depth as to discourage those with little understanding of medical problems from reading them. These pamphlets contain:

- Information pertaining to the nature and progress of diabetes
- A brief overview of the nature of diabetic retinopathy
- Information stressing the importance of early detection and treatment
- Illustrations showing the effects of diabetic retinopathy on the retina
- Summary information about diagnosis and treatment intended to inspire confidence and dispel any fears that may arise from the possibility of medical care
- Encouragement for diabetics to have their eyes examined
- Contact information for service-providing institutes.

(Please see Annexure - 2b pamphlet)

6.13.4. Vehicle sticker

Vehicle stickers are effectively used to increase general awareness of the problem of diabetes and diabetic retinopathy in the community. With cooperation from local government agencies they are displayed in many vehicles in the project area and can therefore be highly visible to a large number of people. Due to their size, they cannot provide a significant amount of information pertaining to the nature of the disease, however. Therefore, they should be used merely as a tool to increase awareness of the problem and



encourage those who see them to pursue further information and treatment on their own. Stickers can be specifically designed to increase awareness on a wide variety of topics, including screening camps, special events, service centres, or general knowledge about the disease. They are employed for all possible purposes. Vehicle stickers contain:

- An eye-catching headline
- A brief statement on the problem of diabetic retinopathy, specifically designed for diabetics

(Please see Annexure 2c - Sticker)

6.13.5. Desktop calendar

Desktop calendars help to increase awareness in specific locations. They are provided free of charge to various organisations with encouragement to display them in visible locations. Individuals like doctors, professionals, and government officials are contacted and encouraged to participate in the program. Desktop calendars contain:

- Basic information about the nature of the disease
- Illustrations showing the effects of diabetes and diabetic retinopathy on the retina
- Encouragement for diabetics to have their eyes examined

6.13.6. Teaching slides and videos

Teaching slides and videos are extremely useful in disseminating information, as they facilitate educational sessions and lessen the demands on knowledgeable staff and doctors. Presentations conducted with slides prepared by the project are easier for both the audience to understand, as they allow for graphical illustrations of otherwise complicated medical information; and the lecturer to present, as the slides contain much of the key points of the presentation, leaving the lecturer only the responsibility to clarify any questions that may arise in the audience. Videos are also of enormous benefit, as they can be distributed to the community and various organisations, after which no further time commitment is necessary on the part of the project.

These videos can be viewed and reviewed at the convenience of their audience, allowing great understanding of their content.

Teaching slides and videos are prepared for a variety of audiences including medical practitioners, paramedical personnel, and community members and organisations. Each of these are prepared independently, keeping the level of KAP revealed in the intended audience. These materials are thorough in the treatment of the content, but remain easily understandable the intended audience, given by their level of KAP. This is done through the use of detailed and comprehensive graphical illustrations, and simplicity in the points covered. Teaching slides and videos contain:

- Basic information about the nature and importance of diabetes
- Signs, symptoms, and risk factors of diabetes
- Treatment options for diabetes
- Basic information about the nature and importance of diabetic retinopathy
- Risk factors of diabetic retinopathy
- Treatment options for diabetic retinopathy
- Information stressing the importance of early detection, and therefore referrals, follow-ups, and regular eye care for diabetics

6.14. Training

The training components are modified from one program to another based upon the needs of that local community. Certainly, the KAP study or similar instrument helps to identify the types of training that practitioners could utilise. The development of



training is associated closely with awareness creation, but obviously extends well beyond awareness.

The development of training courses has several considerations. These include: curriculum development; creation of teaching materials; identification and recruitment of teaching staff; budget considerations; publicity and registration. Resources are therefore allotted specifically to the training component. It may be useful to summarise the results of a recently completed analysis done in an geographic area to illustrate the types of training needs that may arise and the types of training that can be structured.

6.14.1. First, the identified training needs

1. For physicians: Additional training in the symptoms and diagnosis of diabetes and Diabetic Retinopathy; issues related to pregnant diabetics; latest treatment methods for Diabetic Retinopathy and what tertiary facilities are available.
2. For paramedics: Additional training in the symptoms and types of diabetes; risk factors for Diabetic Retinopathy and the day to day

management of diabetes and Diabetic Retinopathy.

6.14.2. Second, some of the training options developed

1. Fellowship programs for ophthalmologists focused on tertiary care of Diabetic Retinopathy
2. Short term courses specific to the use of the indirect ophthalmoscope and laser
3. One day training seminars on the diagnosis of Diabetic Retinopathy

Training needs often are different in rural areas than in urban areas. It is important to assess needs and tailor training with this in mind. It is also important to recognise and address other community health educators with access to the population to be served. These people often are respected in the community and can be a valuable resource and conduct for information.

An assessment of the importance given to diabetes and Diabetic Retinopathy training by local and regional health departments and medical schools help to identify possible training needs and resources.

Annexure**KAP Study Questionnaire**

No:

| | | | |
|--|--|--|--|
| | | | |
|--|--|--|--|

| |
|---|
| Confidential For research and service purpose only |
|---|

Baseline Survey - For Medical Practitioners**Master Questionnaire**

Name : _____

Age :

| | |
|--|--|
| | |
|--|--|

 Sex: M / F

Type : Government / Private Practice / Private Hospital

Mailing :
Address

Phone No. :

Date :

Introduction: The Aravind Eye Hospital, has been working in the field of eye care for the last 25 years. The main focus of its community work has been on cataract and refraction services. Now we would like to provide services to the community in Diabetic Retinopathy. For designing the service we would like some information from you. This will help us to plan and provide better service. This will take about 20 minutes of your time. Please fill up the questionnaire by writing in the response, after which kindly handover the filled in form to the Diabetic Retinopathy team member. You may write the response either in Tamil or English.

Consent : I am willing to provide information. My responses can be used without any change in content.

Yes: _____ No: _____

[Please Sign]

Form checked by : _____

Address

Logo of
Eye HospitalLogo of
Funding Agency

Section 1

We are planning to provide information on diabetes and diabetic retinopathy for medical practitioners. For helping us to decide the content, please answer the following questions.

- 1.1. Please mention all the diagnostic tests for Diabetes?

- 1.2. Please mention all the symptoms of Diabetes?

- 1.3. Please specify the main causes for Diabetes?

- 1.4. Which parts of the body are mainly affected by Diabetes?

- 1.5. List the clinical features of
 - a) Hyperglycemia / Ketoacidosis

 - b) Hypoglycemia

- 1.6. Which diabetic patients are at greatest risk for Diabetic Retinopathy?

- 1.7. What is the treatment for a patient with Diabetic Retinopathy?

- 1.8. How often followup is required for Diabetic Pregnant women?

Section 2

These are some common statements we hear in the community about diabetes. Please read the statement and tick your opinion.

2.1. More uneducated people have diabetes than those who are educated.

1 Strongly Agree 2 Moderately Agree 3 Undecided 4 Moderately Disagree 5 Strongly Disagree

2.2. All Diabetic patients must be referred to Ophthalmologists.

1 Strongly Agree 2 Moderately Agree 3 Undecided 4 Moderately Disagree 5 Strongly Disagree

2.3. As long as the diabetes is kept under control, there is no need to worry about diabetic complication

1 Strongly Agree 2 Moderately Agree 3 Undecided 4 Moderately Disagree 5 Strongly Disagree

2.4. If the doctor has told the diabetes patient to come for regular followup, the patient will come.

1 Strongly Agree 2 Moderately Agree 3 Undecided 4 Moderately Disagree 5 Strongly Disagree

2.5. If the diabetic is treated early on, diabetic retinopathy can be prevented.

1 Strongly Agree 2 Moderately Agree 3 Undecided 4 Moderately Disagree 5 Strongly Disagree

Section 3

Currently there is not much accurate data available regarding diabetic patients, their treatment seeking behaviour and the services available for them. In this section we would like to know about your experience with diabetic patients.

- 3.1. What type of diabetic patients are referred by you to an ophthalmologist?
- 3.2. What proportion of new patients do you routinely screen for diabetes among the patients coming to you?
- 3.3. How do you decide whom to refer for treatment?
- 3.4. When diabetic patients come to you, who else besides you provide advice?
- 3.5. What advice do you give to the patient with diabetes?
- 3.6. How much time does it take for you to explain how to manage diabetes?
- 3.7. Have you taken any sessions in the past one-year to educate the public regarding diabetes?
- 3.8. How often would you advice followup for diabetic pregnant women?
- 3.9. Do you followup the patients you have referred to the specialists?
- 4.0. From which sources have you learned about diabetic retinopathy in the past one year?

Thank you very much for sparing your valuable time!

No:

| |
|--|
| Confidential For research and service purpose only |
|--|

Baseline Survey - For Paramedical Personnel

Master Questionnaire

Name : _____

Age : Sex: M / F

Type : Government / Private Practice / Private Hospital

Mailing :
Address

Phone No. :

Date :

Introduction: The Aravind Eye Hospital, has been working in the field of eye care for the last 25 years. The main focus of its community work has been on cataract and refraction services. Now we would like to provide services to the community in Diabetic Retinopathy. For designing the service we would like some information from you. This will help us to plan and provide better service. This will take about 20 minutes of your time. Please fill up the questionnaire by writing in the response, after which kindly handover the filled in form to the Diabetic Retinopathy team member. You may write the response either in Tamil or English.

Consent : I am willing to provide information. My responses can be used without any change in content.

Yes: _____ No: _____

[Please Sign]

Form checked by : _____

Address

Logo of
Eye HospitalLogo of
Funding Agency

Section 2

These are some common statements we hear in the community about diabetes. Please read the statement and tick your opinion.

2.1. Consuming sweets will result in diabetes.

- 1 Strongly Agree
 2 Moderately Agree
 3 Undecided
 4 Moderately Disagree
 5 Strongly Disagree

2.2. Diabetics are twice as likely to develop eye problem than non-diabetics

- 1 Strongly Agree
 2 Moderately Agree
 3 Undecided
 4 Moderately Disagree
 5 Strongly Disagree

2.3. Persons with a fat body is more prone to diabetes

- 1 Strongly Agree
 2 Moderately Agree
 3 Undecided
 4 Moderately Disagree
 5 Strongly Disagree

2.4. Diabetic retinopathy due to diabetes is a common health problem

- 1 Strongly Agree
 2 Moderately Agree
 3 Undecided
 4 Moderately Disagree
 5 Strongly Disagree

2.5. People who follow proper diet and regular exercise, need not take medicines for diabetes

- 1 Strongly Agree
 2 Moderately Agree
 3 Undecided
 4 Moderately Disagree
 5 Strongly Disagree

2.6. If the blood sugar level is kept under control, the patient need not worry about other complications of diabetes

- 1 Strongly Agree
 2 Moderately Agree
 3 Undecided
 4 Moderately Disagree
 5 Strongly Disagree

2.7. Referring the diabetic patient to an ophthalmologist can prevent diabetic retinopathy

- 1 Strongly Agree
 2 Moderately Agree
 3 Undecided
 4 Moderately Disagree
 5 Strongly Disagree

Section 3

Currently there is not much accurate data available regarding diabetic patients, their treatment seeking behaviour and the services available for them. In this section we would like to know about your experience with diabetic patients.

- 3.1. What advice will you provide when you meet a diabetic patient?

- 3.2. Through which source did you come to know about diabetes in the past one year?

- 3.3. What advice would you give to a person who has a wound, unhealed?

- 3.4. Through what ways did you come to know about diabetic retinopathy?

- 3.5. What type of study material do you have, related to diabetes?
 - 3.5a) Where did you get the study materials?

 - 3.5b) When will you use these study materials?

- 3.6. If a diabetic patient comes to you, to whom will you refer to?

- 3.7. What kind of information did you come to know from the diabetic patient you had referred?

- 3.8. What type of treatment is followed by the people for diabetes?

Thank you very much for sparing your valuable time!

No:

| |
|--|
| Confidential For research and service purpose only |
|--|

Baseline Survey - For Community

Master Questionnaire

Name : _____

Age : Sex: M / F

Type : Government / Private Practice / Private Hospital

Mailing :
Address

Phone No. :

Date :

Introduction: The Aravind Eye Hospital, has been working in the field of eye care for the last 25 years. The main focus of its community work has been on cataract and refraction services. Now we would like to provide services to the community in Diabetic Retinopathy. For designing the service we would like some information from you. This will help us to plan and provide better service. This will take about 20 minutes of your time. Please fill up the questionnaire by writing in the response, after which kindly handover the filled in form to the Diabetic Retinopathy team member. You may write the response either in Tamil or English.

Consent : I am willing to provide information. My responses can be used without any change in content.

Yes: _____ No: _____

[Please Sign]

Form checked by : _____

Address

Logo of
Eye Hospital

Logo of
Funding Agency

Section 1

We are planning to provide information on diabetes and diabetic retinopathy for paramedical. For helping us to decide the content, please answer the following questions.

- 1.1. What is diabetes?
- 1.2. State the symptoms of Diabetes?
- 1.3. What are the causes for Diabetes?
- 1.4. Which parts of the body are mainly affected by Diabetes?
- 1.5. How can diabetes be identified?
- 1.6. What are the treatment methods followed for diabetic retinopathy?
- 1.7. How does diabetes affect the eyes?
- 1.8. How does diabetics are at greatest risk for diabetic retinopathy?
- 1.9. What are the treatments given for diabetic retinopathy?

Section 2

These are some common statements we hear in the community about diabetes. Please read the statement and tick your opinion.

2.1. Diabetes can be cured completely

| | | | | |
|---|---|--------------------------------------|--|--|
| <input type="checkbox"/> 1 Strongly Agree | <input type="checkbox"/> 2 Moderately Agree | <input type="checkbox"/> 3 Undecided | <input type="checkbox"/> 4 Moderately Disagree | <input type="checkbox"/> 5 Strongly Disagree |
|---|---|--------------------------------------|--|--|

2.2. Children can be affected if their parents are diabetic

| | | | | |
|---|---|--------------------------------------|--|--|
| <input type="checkbox"/> 1 Strongly Agree | <input type="checkbox"/> 2 Moderately Agree | <input type="checkbox"/> 3 Undecided | <input type="checkbox"/> 4 Moderately Disagree | <input type="checkbox"/> 5 Strongly Disagree |
|---|---|--------------------------------------|--|--|

2.3. Consuming sweets leads to diabetes

| | | | | |
|---|---|--------------------------------------|--|--|
| <input type="checkbox"/> 1 Strongly Agree | <input type="checkbox"/> 2 Moderately Agree | <input type="checkbox"/> 3 Undecided | <input type="checkbox"/> 4 Moderately Disagree | <input type="checkbox"/> 5 Strongly Disagree |
|---|---|--------------------------------------|--|--|

2.4. Diabetes is more among rich people

| | | | | |
|---|---|--------------------------------------|--|--|
| <input type="checkbox"/> 1 Strongly Agree | <input type="checkbox"/> 2 Moderately Agree | <input type="checkbox"/> 3 Undecided | <input type="checkbox"/> 4 Moderately Disagree | <input type="checkbox"/> 5 Strongly Disagree |
|---|---|--------------------------------------|--|--|

2.5. Diabetes can be cured completely by proper diet control

| | | | | |
|---|---|--------------------------------------|--|--|
| <input type="checkbox"/> 1 Strongly Agree | <input type="checkbox"/> 2 Moderately Agree | <input type="checkbox"/> 3 Undecided | <input type="checkbox"/> 4 Moderately Disagree | <input type="checkbox"/> 5 Strongly Disagree |
|---|---|--------------------------------------|--|--|

2.6. Diabetics are more likely develop eye problems than non-diabetics

| | | | | |
|---|---|--------------------------------------|--|--|
| <input type="checkbox"/> 1 Strongly Agree | <input type="checkbox"/> 2 Moderately Agree | <input type="checkbox"/> 3 Undecided | <input type="checkbox"/> 4 Moderately Disagree | <input type="checkbox"/> 5 Strongly Disagree |
|---|---|--------------------------------------|--|--|

2.7. All diabetics should have a periodic eye examination by an ophthalmologist once in a year

| | | | | |
|---|---|--------------------------------------|--|--|
| <input type="checkbox"/> 1 Strongly Agree | <input type="checkbox"/> 2 Moderately Agree | <input type="checkbox"/> 3 Undecided | <input type="checkbox"/> 4 Moderately Disagree | <input type="checkbox"/> 5 Strongly Disagree |
|---|---|--------------------------------------|--|--|

Section 3

Currently there is not much accurate data available regarding diabetic patients, their treatment seeking behaviour and the services available for them. In this section we would like to know about your experience with diabetic patients.

Diabetic patients

- 3.1. When and how did you come to know that you have diabetic mellitus?
- 3.2. For how many years / months are you a diabetic patient?
- 3.3. What are the treatment methods you follow to control diabetes?
- 3.4. Is there any one, besides you, suffering from diabetic mellitus in your family?. If yes, who is/are affected and for how long?
- 3.5. What treatment methods do they follow?
- 3.6. How many times have you undergone dilated fundus examination after knowing that you are a diabetic?
- 3.7. Have you shared your experience regarding diabetes either with your family members or friends?
- 3.8. Through which sources did you come to know about diabetic retinopathy ?
- 3.9. What are the treatments for diabetic retinopathy and where they are available?
- 3.10. What advices would you give to diabetic patients?

Non-diabetic patients

- 1a. Is any of your family members affected by diabetes?

- 3.2a. In what ways are you helping your family members with diabetes?

- 3.3a. What are the advices given by you to diabetic patients?

- 3.4a. Do you refer diabetic patients to an ophthalmologist?

- 3.5a. From which source did you come to know about diabetes and diabetic retinopathy?

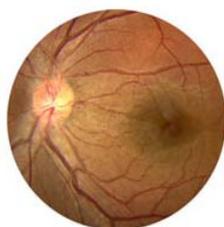
- 3.6a. What are the information gathered from the diabetic patients after their eye examination, which you had refered to an ophthalmologists?

- 3.7a. What kind of treatment method is generally followed by the people for diabetes?

- 3.8a. What is the treatment for diabetic retinopathy?

Thank you very much for sparing your valuable time!

Annexure 2

ARE YOU DIABETIC?**DIABETES AFFECTS THE EYE**

HEALTHY RETINA

RETINA DAMAGED BY DIABETIC RETINOPATHY

MACULAR EDEMA



BLEEDING

ONLY AN OPHTHALMOLOGIST CAN IDENTIFY
THE EARLY SYMPTOMS OF DIABETIC RETINOPATHY

**DO NOT MISS THIS OPPORTUNITY
TO PRESERVE YOUR SIGHT**

FOR DETAILS, CONTACT CO-ORDINATOR, RETINA CLINIC, PONDICHERRY

Logo of
Eye Hospital

Logo of
Funding Agency

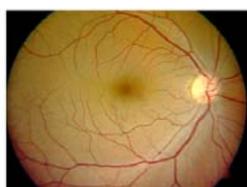
Annexure 2a

Are You a Diabetic?

**CHANCES ARE YOU MAY ALREADY
BE LOSING YOUR SIGHT**

Diabetic Retinopathy (DR)

Vision



Normal Retina



Good Vision



Early DR



No visual difference



Moderate DR



Visual difference



Advanced DR



Visual loss

**DO NOT MISS THIS OPPORTUNITY
TO PRESERVE YOUR EYESIGHT**

Logo of
Eye Hospital

Consult your ophthalmologist

Logo of
Funding Agency

Magnitude of Diabetes and Diabetic Eye Diseases in India

Increasing incidence of diabetes mellitus poses a major health problem in India. It was the 17th cause of blindness 20 years ago in India, but today it has ascended to the 6th position.

The contributing factors are:

- Heredity
- Inappropriate diet high in fat and carbohydrates
- Sedentary life-styles
- Obesity

Diabetes may affect both the young (type I) and the old (type II). The latter type is far more common.

Regardless of the type of diabetes, many diabetics develop an ocular complication called diabetic retinopathy: a change in the retinal blood vessels that leads to loss of vision.

Diabetic Retinopathy: A Silent Presence

- The most common eye complication in diabetes is diabetic retinopathy; the other complications are cataract and glaucoma.
- Early detection and timely treatment of diabetic eye disease significantly reduces risk of vision loss.
- Diabetic retinopathy produces visual symptoms only when it is very advanced. Since only an ophthalmologist can detect early signs of diabetic retinopathy, all diabetics should have their eyes examined at least once a year.

How Does Diabetes affect the Eye?

Diabetes produces weakening of the blood vessels in the body. The tiny delicate retinal blood vessels are particularly susceptible. This deterioration of retinal blood vessels, accompanied by structural changes in the retina is termed diabetic retinopathy which leads to loss of vision.

Initially the disease is symptomless (i.e.) patients will have no complaints and they will have perfect vision. But at the same time bleeding or swelling of retina will be taking place. It is treatable only at this stage and this can be identified only on examination by the ophthalmologists. That is why it is important to have the retina examined regularly even if your vision is normal.

There are two main causes of vision loss in diabetic retinopathy:

Diabetic Macular Edema: Weakened blood vessels leak and accumulate fluid in the retina causing swelling and exudation in the macula of retina resulting in moderate vision loss.

PDR: When new abnormal blood vessels grow or proliferate, bleeding into vitreous may occur with sudden severe vision loss.



Macular edema

This causes swelling and exudation in the macula

PDR

New blood vessels rupture and bleed into the vitreous

Eye Examination in Diabetic Retinopathy

Every diabetic is at risk for developing diabetic retinopathy. Sometime this can happen even if the blood sugar is kept under good control.

There are no symptoms at the initial stages. Periodic eye examination with dilated pupils is the only way to detect diabetic retinopathy in early stage and prevent further deterioration of vision.

Diagnosis

Diagnostic tools such as a slit lamp, ultra sound and procedures like fluorescein angiography are used in addition to an ophthalmoscope, to assess the level of diabetic retinopathy.

Fluorescein Angiography

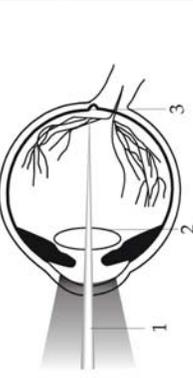
This is a magnified photography of the retina using an injectable dye. It helps to stage diabetic retinopathy, record changes in the retinal blood vessels, and to decide on the need and mode of treatment and evaluate the treatment.

Treatment

Lasers are widely used in treating diabetic retinopathy. It is an intense and highly energetic beam of light that can stop or slow down the progression of diabetic retinopathy and improve or stabilise vision.

The Laser Experience

Laser treatment is usually performed as an outpatient procedure. The patient is given topical anaesthesia to prevent any discomfort and is then positioned before a slit lamp. The ophthalmologist guides the laser beam precisely



1. The laser is beamed into the eye
2. It passes through the transparent structures of the eye and continues on to the retina
3. It is stopped by the pigment layer of the retina, where it is converted into heat. The heat coagulates, or congeals the retinal layers

on the areas to be treated, with the aid of the slit lamp and a special contact lens. Absorption by the diseased tissue either reduces the retinal thickening or stops bleeding. Additional treatment may be required depending on the patient's condition.

SIDE EFFECTS: Some patients may experience side effects after laser treatment. These are usually temporary. Possible side effects include watering eyes, mild headache, double vision, glare or blurred vision. In case of sudden pain or vision loss, the ophthalmologist must be contacted immediately.

Vitrectomy

In some patients, there may be bleeding into the vitreous or the vitreous may pull on the retina reducing vision severely. These are signs of advanced stages of Diabetic Retinopathy. In such instances a surgical procedure called vitrectomy (replacing the vitreous by a clear artificial solution) is performed.

REMEMBER

Diabetic retinopathy is often symptomless until the last stage. Once symptoms show up, it is often too late to prevent loss of vision. Hence all diabetics must visit an ophthalmologist once a year to monitor the retina and watch for diabetic retinopathy. Once it is diagnosed, they may need frequent visits to check the progression of the disease with appropriate treatment.



Diabetes
can cause damage to the retina and lead to **Blindness**



Periodical Checkup
by an ophthalmologist is
the only means to
Preserve Vision

Address

Logo

World Diabetes Day

November - 14

Your vision is your life.

Are you Diabetic?

Diabetes can affect your eyes



Logo of
Eye Hospital

Address

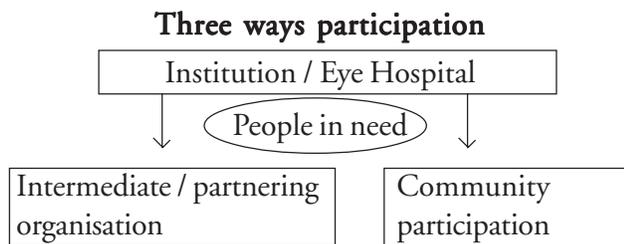
Logo of
Funding Agency

CHAPTER 7

Community Based Screening Models

Community outreach is an extended service of the provider hospital. It is conducted outside the institutions but within the community to facilitate access to service.

The primary objective of community outreach activity is the screening camp, which requires the involvement and commitment of both the hospital and community.



7.1. Objectives of the diabetic retinopathy screening

- To reach the needy (diabetics) people where they are
- To involve the community (voluntary organisations and primary care physicians) in Diabetic Retinopathy awareness creation
- To screen the high risk diabetic cases in the general population for Diabetic Retinopathy

7.2. Diabetic Retinopathy screening camp

A team of medical and paramedical personnel with sufficient equipment, who work linearly with the diabetes screening team, screen the diabetic patients for Diabetic Retinopathy. The major activities in community outreach camps are screening, diagnosing, advising the early Diabetic Retinopathy patients on the medical management and referring those requiring further treatment to the tertiary care centres.

7.2.1. Types of diabetic retinopathy screening camp

There are two types of Diabetic Retinopathy screening camps. One is for known diabetics and the other one is for diabetes detection and Diabetic Retinopathy screening for diabetics.

The first type of screening camp is conducted in association with diabetologists or general medical practitioners to their diabetic patients only. This type of camp does not need any publicity to assemble the patients at one place.

The second type of screening camp is diabetic detection in the general public and Diabetic Retinopathy screening for diabetics. These type of camp needs specific publicity and separate infrastructure. Screening for diabetes and Diabetic Retinopathy is done simultaneously. The detected diabetic patients are screened for Diabetic Retinopathy through dilated fundus with help of Direct and Indirect Ophthalmoscope by ophthalmologists.

Screening for diabetes is usually accomplished through a blood test (finger prick sample), since testing the urine sample requires extra facilities and is beset with sanitary concerns. Moreover it is a less reliable test.

Since the second type of camp includes all elements of the first, the following overview of preparation and protocol focuses on the second type of camp for both Diabetic and Retinopathy screening.

Camp planning: There are six basic pre-camp issues to be resolved prior to the operation of the camp. Each is listed below with examples of issues to be considered.

7.2.2. Selection of Geographic target Area

Area identification is the first and foremost step to a successful Diabetic Retinopathy screening camp. Since population density is higher in urban areas, diabetic prevalence is higher in urban areas. There are also more diabetic care centres in urban areas.

7.2.3. Partners identification

After the area is selected, a survey is made to identify the service organizations like Lions/Rotary, Diabetics association, Welfare organisation and Youth association. For diabetic detection it is important to seek the help of medical practitioners and physicians who have clinical labs.

7.2.4. Partner responsibilities

Since more than one partner is involved in these camps, it is important to clarify the roles and responsibilities of each partner to avoid confusion amongst between the partners. This should be discussed in the initial stage. It is also most important to discuss with the partners the minimum budget for conducting a camp, selection of site, date and time, adequate space, toilets, and furniture, and near by public transportation. (Note: Plan dates on weekends to avoid conflicts with work and on weekends that do not conflict with religious activities/ local festivals).

7.2.5. Publicity

People generally believe that “camp” means a cataract screening camp. Diabetic Retinopathy screening camp is a new concept, and people may not be aware of this camp. This type of camp needs specific publicity. Publicity material should contain information on where, when, for what, and to whom these camps are useful. Moreover, as diabetics are in the active earning age groups, they don't have time to attend camps. If promotional activities are started at least fifteen days before the camp, diabetic patients may postpone their regular works and plan to attend the camp.

7.2.6. Resources (Check lists)

On the previous day of the camp, the camp organiser has to plan the manpower and materials such as dilating drops, camp case sheets and pamphlets needed for the camp. This may be estimated on the basis of partners' influence in the community and estimated number of diabetic patients in that area. (Please see Annexure 3 - Manpower plan for DR camp).

7.2.7. Effective Strategy for success of the camp

The strategy that was most successful in one place may not be applicable elsewhere. So suitable strategy should be evolved modified depending upon the place.

a. Voluntary organisations (Lions/Rotary clubs)

Lions and Rotary clubs are the organisations serving the community at the world level. Their motto is “service to the community”. They are influenced and recognised by the community. They have their own systematic plan and strategy to reach the community. If the camps are organised in collaboration with these clubs they are more effective and the response is also good.

b. Diabetologist / Medical Practitioners (Family doctor)

A diabetic patient's first contact is with primary care physician and later a diabetologist for a second opinion. Patients have faith in these medical people. If the camps are arranged with medical practitioners, they will refer their own diabetic patients to the camp and do diabetic screening from the general public with the help of drug companies.

c. NGO's

Non Governmental Organisations (NGO) are working at the grassroots level. They know the people's need and their schedules. These NGOs have strong networks and attachment with communities especially in rural areas.

d. Organisation / association (Youth, Religious)

These are the interested groups who want to do something for their own groups. The camps hosted with these people are successful because of shared responsibility of the group members and strong sectional feeling.

e. Government sectors (Health sectors)

To some extent the chief functionaries of government agencies are interested in organising such camps but the subordinates don't take the responsibility for success of the camp. If hosting a camp is given as one of their target activities, they will be interested.

7.3. Diabetic retinopathy screening camp protocol

7.3.1. Step one: Diabetes screening

The details of the patient's name, age, sex and address are registered in the register notebook and the patients are given a card for diabetic screening. Then, the patients undergo random blood glucose tests with



Blood test in the camp



Preliminary test in the camp



Indirect ophthalmoscopy in the camp



Publicity banner



Registration in the camp

the help of a strip and a glucometer. A patient's height, weight and hypertension are also measured. The patients are asked whether he/she is a known diabetic or has come to learn about his/her diabetic status. This information is also entered in the card. All the patients are referred to the physician for his advice. The physician sees all the patients, gives advice and refers the diabetic patients for Diabetic Retinopathy screening. The non-diabetic patients receive the physician's advice only. IEC materials are given to all the outpatients at registration counter.

7.3.2. Step two: Diabetic retinopathy screening

1. Registration: All the diabetic patients are registered in another separate register. A screening card with the details collected in the diabetic screening is provided.

2. Vision test: All diabetics are tested for visual acuity. This is done in a separate room with the Snellen's chart at a distance of 6 meters from vision chart.

3. Preliminary Eye Examination: After the visual acuity test, patients undergo a preliminary vision examination to decide whether the patient's eyes should be dilated. The patients are asked about their eye history, quick examination for cataracts, glaucoma and other visual complications is made, and information is noted on the patient's cards.

4. Dilation: After the preliminary eye examination, intraocular pressure is measured with the help of Tonometer before dilatation. The dilating eye drops are applied for all the diabetic patients. Patient's sit in a darkroom till the eyes are fully dilated, then are

taken for a more thorough Diabetic Retinopathy screening.

5. Diabetic retinopathy screening: Examination takes place in a darkened booth (constructed on site using dark cloth) using direct and indirect ophthalmoscope. This provides a wide field of vision but low magnification, and patients who detected with the signs of Diabetic Retinopathy are referred to the base hospital. Others will be given suitable advice.

6. Counselling: All diabetics leave with information concerning the diagnosis of diabetes and Diabetic Retinopathy. They are given more detailed information about the disease, its effects, and the treatment options, including the recommended course of action and laser treatment.

They are informed of the locations where treatment is available, and encouraged to come to the hospital to receive treatment.

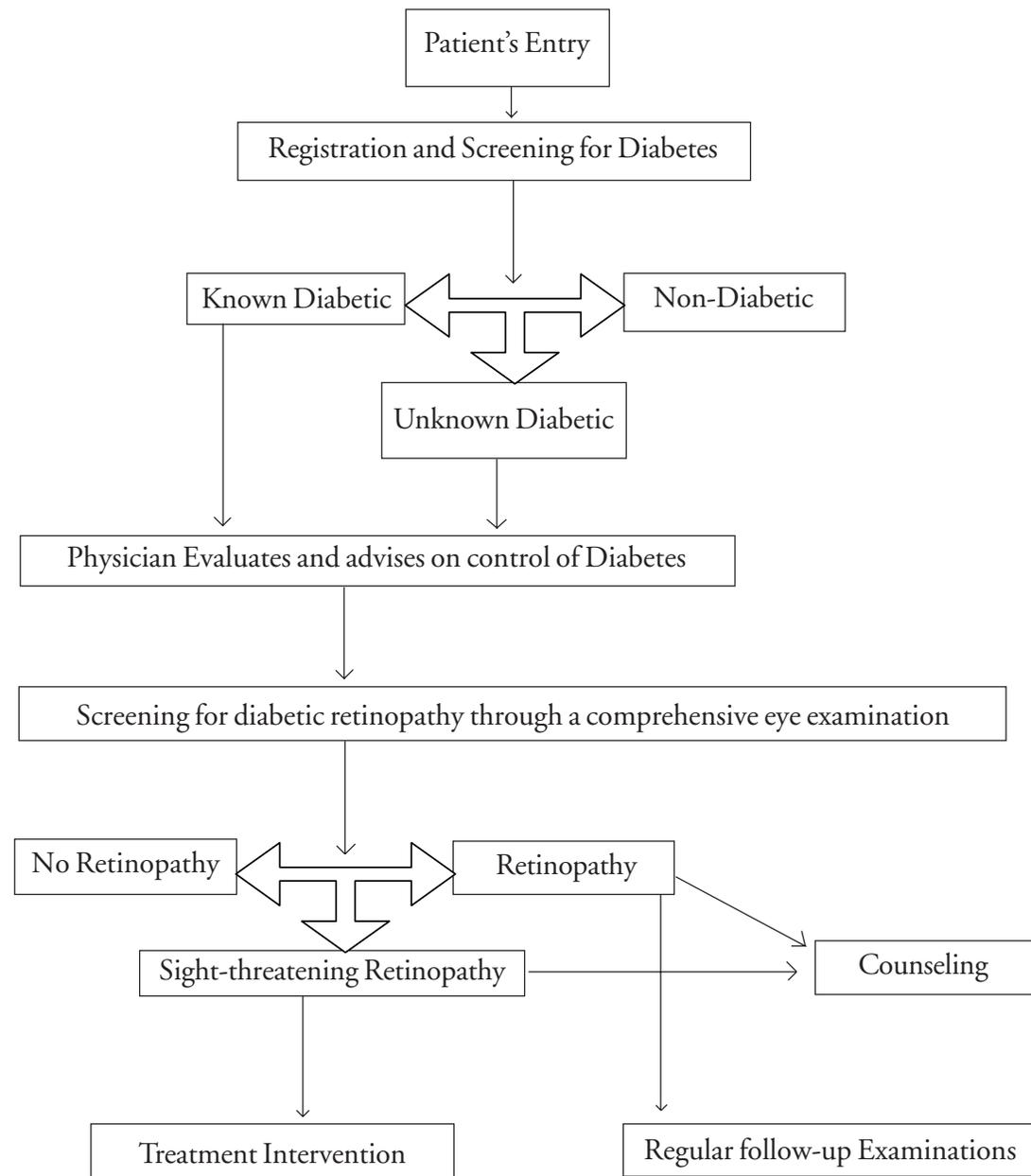
(Please see Annexure - 4 screening protocol in camp)

(Please see Annexure - 5 camp patient's screening form).

Annexure 3

Manpower plan for DR camp

| S.No | Designation | Manpower | No. of expected Diabetics from out patients | | | |
|------|----------------------|-----------------|---|-----------|-----------|-----------|
| | | | < 50 | 50-100 | 100-200 | 200-300 |
| 1 | Doctors | Medical Officer | | 1 | 1 | 1 |
| | | Retina Fellow | 1 | 1 | 1 | 1 |
| | | PG Student | 1 | 1 | 1 | 2 |
| 2 | Ophth. Nurse | To assist Mos | 1 | 1 | 2 | 2 |
| | | IOP exam. | 1 | 1 | 1 | 1 |
| | | Pre vision | 1 | 1 | 1 | 2 |
| 3 | Ophth. Technician | Refraction | 1 | 1 | 1 | 2 |
| 4 | Patient's Counsellor | | 1 | 1 | 1 | 2 |
| 5 | Co-ordinator | | 1 | 1 | 1 | 1 |
| 6 | Driver | | 1 | 1 | 1 | 1 |
| | Total | | 9 | 10 | 11 | 15 |

Annexure 4**Screening protocol flow chart in camps**

Annexure 5**DIABETIC RETINOPATHY PROJECT****Camp Patients Screening Form**

S.No : _____ Camp No : _____
 Camp Place : _____ Date : _____

| | | |
|-------------------------|------------------|-------------|
| Name : _____ | Age: _____ | Sex : _____ |
| Door No. Street : _____ | | |
| Place : _____ | | |
| Taluk : _____ | District : _____ | |

Diabetic History

| | |
|---|---------------------------|
| Known diabetic : <input type="checkbox"/> Yes <input type="checkbox"/> No | Urine Sugar : |
| If Yes, Duration _____ Years _____ Month | Urine Albumin: |
| Treatment : <input type="checkbox"/> Yes <input type="checkbox"/> No | Blood Sugar : |
| Family History : <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't know | BP _____ / _____ mm of Hg |
| | Weight : _____ Kgs |
| | Height : _____ cms |

Ocular Examination

| | | Right Eye | Left Eye |
|-----------------------|-------------------|-----------|----------|
| Vision | Presenting vision | | |
| Intra Ocular Pressure | | | |

Mark 'X' if not applicable '√' if applicable. Do not leave any box blank

| | Right Eye | Left Eye |
|-----------------------|--------------------------|--------------------------|
| Corneal Opacity | <input type="checkbox"/> | <input type="checkbox"/> |
| Pupillary abnormality | <input type="checkbox"/> | <input type="checkbox"/> |
| Cataract | <input type="checkbox"/> | <input type="checkbox"/> |
| Aphakia | <input type="checkbox"/> | <input type="checkbox"/> |
| Pseudophakia | <input type="checkbox"/> | <input type="checkbox"/> |

Past Treatment for DR :

| | | Yes | No |
|------------|--|--------------------------|--------------------------|
| If Yes | | Right Eye | Left Eye |
| Laser | | <input type="checkbox"/> | <input type="checkbox"/> |
| Vitrectomy | | <input type="checkbox"/> | <input type="checkbox"/> |
| Don't know | | <input type="checkbox"/> | <input type="checkbox"/> |

| |
|--|
| |
|--|

Fundus Examination**Direct Ophthalmoscopy**

| | Right Eye | Left Eye |
|------------------------------|--------------------------|--------------------------|
| Microaneurysms | <input type="checkbox"/> | <input type="checkbox"/> |
| Haemorrhages | <input type="checkbox"/> | <input type="checkbox"/> |
| Hard Exudates | <input type="checkbox"/> | <input type="checkbox"/> |
| Cotton Wool Spots | <input type="checkbox"/> | <input type="checkbox"/> |
| CSME | <input type="checkbox"/> | <input type="checkbox"/> |
| I.R.M.A. | <input type="checkbox"/> | <input type="checkbox"/> |
| NVD / FPD | <input type="checkbox"/> | <input type="checkbox"/> |
| NVE / FPE | <input type="checkbox"/> | <input type="checkbox"/> |
| Vitreous Haemorrhages | <input type="checkbox"/> | <input type="checkbox"/> |
| TRD | <input type="checkbox"/> | <input type="checkbox"/> |
| Focal Marks | <input type="checkbox"/> | <input type="checkbox"/> |
| PRP Marks | <input type="checkbox"/> | <input type="checkbox"/> |
| Post Vitrectomy status | <input type="checkbox"/> | <input type="checkbox"/> |
| Unable to grade (Media Hazy) | <input type="checkbox"/> | <input type="checkbox"/> |
| Associated Ocular Diseases | | |
| If any specify | | |

Fundus Examination**Indirect Ophthalmoscopy**

| | Right Eye | Left Eye |
|------------------------------|--------------------------|--------------------------|
| Microaneurysms | <input type="checkbox"/> | <input type="checkbox"/> |
| Haemorrhages | <input type="checkbox"/> | <input type="checkbox"/> |
| Hard Exudates | <input type="checkbox"/> | <input type="checkbox"/> |
| Cotton Wool Spots | <input type="checkbox"/> | <input type="checkbox"/> |
| CSME | <input type="checkbox"/> | <input type="checkbox"/> |
| I.R.M.A. | <input type="checkbox"/> | <input type="checkbox"/> |
| NVD / FPD | <input type="checkbox"/> | <input type="checkbox"/> |
| NVE / FPE | <input type="checkbox"/> | <input type="checkbox"/> |
| Vitreous Haemorrhages | <input type="checkbox"/> | <input type="checkbox"/> |
| TRD | <input type="checkbox"/> | <input type="checkbox"/> |
| Focal Marks | <input type="checkbox"/> | <input type="checkbox"/> |
| PRP Marks | <input type="checkbox"/> | <input type="checkbox"/> |
| Post Vitrectomy status | <input type="checkbox"/> | <input type="checkbox"/> |
| Unable to grade (Media Hazy) | <input type="checkbox"/> | <input type="checkbox"/> |
| Associated Ocular Diseases | | |
| If any specify | | |

Diagnosis:

| Diabetic Retinopathy : | Yes | | No | |
|-------------------------------|--------------------------|--|--------------------------|--|
| | Right Eye | | Left Eye | |
| If Yes | | | | |
| NPDR (Mild / Moderate) | <input type="checkbox"/> | | <input type="checkbox"/> | |
| NPDR (Severe) | <input type="checkbox"/> | | <input type="checkbox"/> | |
| PDR | <input type="checkbox"/> | | <input type="checkbox"/> | |
| CSME | <input type="checkbox"/> | | <input type="checkbox"/> | |

Advice

| | | | | |
|------------------------|-------------------------------------|---------------------------------------|---|-----------------------------------|
| Referred to AEH | | | Yes | No |
| If yes for | <input type="checkbox"/> FFADR | <input type="checkbox"/> Laser DR | <input type="checkbox"/> Cataract | <input type="checkbox"/> Glaucoma |
| | <input type="checkbox"/> FFA Others | <input type="checkbox"/> Laser Others | <input type="checkbox"/> Other Speciality | |
| If No, follow-up after | <input type="checkbox"/> 3 months | <input type="checkbox"/> 6 Months | <input type="checkbox"/> 1 Year | |

DIABETIC RETINOPATHY SCREENING CAMP- Follow-up card

S.No : _____ Camp No. _____ Name : _____

Camp Date : _____ Diagnosis : _____ Camp Place: _____

Advise : _____ Follow-up date : _____ Sign. of Ophthalmologist _____

CHAPTER 8

Networking and Linkages

8.1. Partners and networks

Awareness creation programmes can benefit enormously by the involvement and inclusion of other organisations already established in the community. These organisations can provide a wide variety of aid, including support in the form of:

- Information dissemination
- Venues for displaying IEC Materials
- Organisational assistance
- Venues for screening camps
- Volunteer staff

8.1.1. Many organisations in various fields are good candidates for a strong network of partners

These include

- Diabetologist - Diabetologists have pre-existing contacts with diabetics in the community, who are the primary focus in awareness creation activities of the project. Hence, they are in a position to spread information very effectively during these contacts.
- LIONS clubs
- Rotary clubs
- Local NGOs working in health sectors - Local NGOs will have pre-existing networks of willing volunteers to aid in the distribution of pamphlets and booklets, and pasting of stickers and posters.
- TV and Radio stations - These groups are invaluable for spreading information into rural areas and amongst illiterate population.
- Newspapers - Newspaper articles and advertisements effectively spread information to those who read them.
- Local Government officers - Without the cooperation of local government officers, local

government workers are less inclined to actively participate in awareness creation projects and activities. These officers should be involved early on in the project to ensure that they are aware of the project and its importance.

- General medical practitioners
- Eye care service providers
- Paramedical personnel - As the initial, and sometimes the only, medical contact for large section of rural populations, paramedical personnel are vitally important to the success of awareness creation programmes.
- Charitable organisations
- Everyone can help spread the message about diabetic retinopathy. Studies have shown that diabetics actively share and discuss their ailment experiences with their friends and family members. Every member of the community has the potential opportunity to spread awareness on diabetic retinopathy.

8.2. Some partners for networking

Rural areas

- Rural Medical officers
- Paramedical personnel
- Non-Governmental Organisations
- Tamilnadu Integrated Nutrition projects staff
- PHC Staff
- Teachers
- Self-help groups

Urban Areas

- Media (Press)
- Lions clubs and Rotary clubs
- Diabetologists
- Indian Medical Association
- General medical practitioners

- Urban paramedical workers
- Integrated child development scheme staff
- NSS programme officers
- Medical shop owners (or their Association)
- Diagnostic Laboratory owners (or their Association)
- Industries
- Walkers club association
- Bank managers

8.3. Advocacy

Advocacy plays out at different levels in any initiative, essentially by creating an enabling environment, opening doors to required resources and actually helping in the implementation or delivery of services.

It is a very thin line that divides advocacy from creating awareness and education from action. “Advocates” can be defined as those who are in a position to enable and enrich the process but are not directly involved in the delivery of eye care either as providers or as recipients of the services (such as patients).

Advocacy Target Groups

Using advocacy to enhance service delivery, the advocates are broadly categorized as

- Policy implementers such as the government officials at the local, District, State, Province, level etc.
- Community leaders and opinion makers
- Health professionals including the ophthalmic community

Related personnel

- School teacher
- Volunteers
- Private sector professionals
- The community, and personnel working closely with the community

Infrastructure

- Use existing health care system
- Use existing community health centres and programmes
- Get private practitioners to participate
- Use public media (Newspapers, Television, All India Radio)

CHAPTER 9

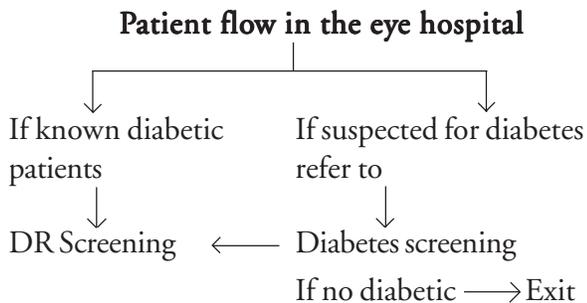
Delivering Quality Services

9.1 Standardising clinical protocol

9.1.1. Current scenario

- Ophthalmologist are not trained for Indirect Ophthalmology examination
- No routine fundus examination is performed
- Emphasis on refraction and glasses only
- Patients also prefer this as this is quick process
- Even if the ophthalmologist are aware of patients' diabetic status he does no fundus examination
- Only when patients come with loss of vision and the ophthalmologist are not able to find any refractive cause or cataract he will perform a fundus examination or refer the patient.

9.1.2. Patient flowchart



9.1.3. Initial exam history

- Ocular symptoms
- Age of onset of diabetes
- Glucose status (Hemoglobin A1c)
- Treatment History
- Systemic hypertension
- Serum lipid levels
- Renal history
- Family history
- Social history (alcohol, cigarettes)

9.1.4. Initial physical exam

- Best corrected visual acuity
- Ocular alignment and motility
- Pupil reaction
- Slit-lamp biomicroscopy (cornea, iris, lens vitreous)
- Stereo examination with biomicroscopy of the posterior pole
- Examination of the peripheral retina
- Measurement of Intra Ocular Pressure (IOP)
- Confrontation visual fields
- Gonioscopy when indicated (for neovascularisation of the iris or increased IOP)

9.1.5. Diagnosis

- Classify both the eyes as to category and severity of diabetic retinopathy, with presence/absence of clinically significant macular edema (CSME).

9.1.6. Follow-up history

- Visual symptoms
- Duration
- Glucose status
- Glucose control medications and control regimen
- Changes in medications

9.1.7. Follow-up physical examination

- Best corrected visual acuity
- Slit-lamp biomicroscopy with iris examination
- Stereo examination with biomicroscopy of the posterior pole
- Examination of the peripheral retinal, best performed with indirect ophthalmoscopy
- Measurement of IOP
- Gonioscopy when indicated (for neovascularisation of the iris or increased IOP)

9.1.8. Patient education

- Discuss results of exam and implications
- Educate patients on the importance of reducing blood pressure and serum lipid levels. If the patient has high blood pressure and increased serum lipid levels educate him on the importance of reducing high blood pressure and serum lipid levels.
- Educate patients about the importance of maintaining good glucose control and monitoring HbA1c (*A test that measures a person's average blood glucose levels over the past 2 to 3 months. Hemoglobin is the part of a red blood cell that carries oxygen to the cells and sometimes joins with the glucose in the bloodstream. Also called hemoglobin A1C or glycosylated hemoglobin, the test shows the amount of glucose that sticks to the red blood cell, which is proportional to the amount of glucose in the blood.*)
- Advise patients with new visual symptoms to contact their ophthalmologist in a timely manner
- Communicate with the attending physician, e.g. family physician, internist, or endocrinologist regarding eye findings and other significant findings.
- Refer for or encourage patients with significant visual impairment or blindness to use appropriate vision rehabilitation and social services.

International clinical diabetic retinopathy disease severity scale

| Proposed disease severity level | Findings observable upon dilated ophthalmoscopy |
|---|---|
| No apparent retinopathy | No abnormalities |
| Mild non-proliferative diabetic retinopathy | Microaneurysms only |
| Moderate non-proliferative diabetic retinopathy | More than just microaneurysms but less than Severe NPDR |

| Proposed disease severity level | Findings observable upon dilated ophthalmoscopy |
|---|---|
| Severe non-proliferative diabetic retinopathy | Any of the following <ul style="list-style-type: none"> • More than 20 intraretinal hemorrhages in each of 4 quadrants • Definite venous beading in 2+ quadrants • Prominent IRMA in 1+ quadrant And no signs of proliferative retinopathy |
| Proliferative diabetic retinopathy | One or more of the following <ul style="list-style-type: none"> • Neovascularisation • Vitreous / preretinal hemorrhage |

International clinical diabetic retinopathy disease severity of diabetic macular edema

2 Major levels, with subcategories for diabetic macular edema

| Proposed classification | Findings observable upon dilated ophthalmoscopy |
|--------------------------------|--|
| Diabetic macular edema absent | No retinal thickening or hard exudates in posterior pole |
| Diabetic macular edema present | Some retinal thickening or hard exudates in posterior pole |

If diabetic macular edema is present, it can be categorised as follows

Proposed classification

Diabetic macular edema present

Findings observable upon dilated ophthalmoscopy**Mild diabetic macular edema**

Some retinal thickening or hard exudates in posterior pole but distant from the macula

Moderate diabetic macular edema

Retinal thickening or hard exudates approaching the center of the macula but non involving the center

Severe diabetic macular edema

Retinal thickening or hard exudates involving the center of the macula

American academy of ophthalmology, the eye M.D. association, october 2002

General management recommendations

| Level of retinopathy | Evaluation | | Treatment strategies | |
|--------------------------|-------------------------|--------------------------|----------------------|--------------------|
| | Fluorescein angiography | PRP | Focal | Follow-up (months) |
| Mild NPDR | | | | |
| No macular edema | No | No | No | 12 |
| Macular edema | No | No | No | 4-6 |
| CSME | Yes | No | Yes | 2-4 |
| Moderate NPDR | | | | |
| No macular edema | No | No | No | 6-8 |
| Macular edema (not CSME) | No | No | No | 4-6 |
| CSME | Yes | No | Yes | 2-4 |
| Severe NPDR | | | | |
| No macular edema | No | Rarely | No | 3-4 |
| Macular edema (not CSME) | No | Occasionally after focal | Occasionally | 2-3 |
| CSME | Yes | Occasionally after focal | Yes | 2-3 |
| Very Severe NPDR | | | | |
| No macular edema | No | Occasionally | No | 2-3 |
| Macular edema (not CSME) | No | Occasionally after focal | Occasionally | 2-3 |
| CSME | Yes | Occasionally after focal | Yes | 2-3 |

| Level of retinopathy | Evaluation | | Treatment strategies | |
|---------------------------|-------------------------|--------------------------|----------------------|--------------------|
| | Fluorescein angiography | PRP | Focal | Follow-up (months) |
| Non-high- risk PDR | | | | |
| No macular edema | No | Occasionally | No | 2-3 |
| Macular edema (not CSME) | No | Occasionally after focal | Occasionally | 2-3 |
| CSME | Yes | Occasionally after focal | Yes | 2-3 |
| High-risk PDR | | | | |
| No macular edema | No | Yes | No | 2-3 |
| Macular edema (not CSME) | Yes | Yes | Usually | 1-2 |
| CSME | Yes | Yes | Yes | 1-2 |

Albert, Daniel M; Jakobiec, Frederick A, jt ed. Principles and Practice of Ophthalmology / Vol: 3 - Retina and Vitreous Ed. 2, Philadelphia: W B Saunders, 2000. 6v., lviii, 1599-2552p. Chapter 128

CHAPTER 10

Information Technology - Emerging Opportunity in Diabetic Retinopathy services

Nowadays applications of information technology are greatly benefitting the local community. Advancements in medicine and in the medical equipment industry have made it very conducive to integrate information technology and to practice telemedicine. Both government and private sector health-care institutions have undertaken many initiative throughout India. Indian Space Research Organisation (ISRO) has been supporting tertiary hospitals to establish links with the remote places like North-East on a pilot basis. By sharing the satellite bandwidth and hardware, access to quality health care by the remote population is possible.

10.1. Ophthalmology and information technology

Because most diagnosis is image based, ophthalmology is one of the rapidly developing fields in health care that is more appropriate for telemedicine. Currently most ophthalmic equipment is integrated with IT (Information Technology) that allows image capture, and the transfer of images ensuring required standards like digital imaging and communications in medicine (DICOM). Similarly, by the Government is working to ensure IT penetration, even in the rural areas that have higher bandwidth of 2 MBPS connectivity.

Tele-ophthalmology is being effectively deployed at various levels to enable easier access to eye care, including the subspecialty eye problems, and to play a major role in screening patients. Information Technology is being effectively used for DR screening at the following levels:

10.1.1. Primary level

The vision centre model envisaged by the VISION 2020 – The Right to Sight, a global initiative, is being

adopted by various eye care programmes. The core objective of these Vision Centres is to provide comprehensive care by integrating information technology effectively to provide quality eye care at the doorsteps of the rural population. Patients examined at the vision centre have consultation with the Ophthalmologist at the base hospital. Patients requiring further management are referred to the base hospital.

10.1.2. Strategies

- The diabetic patients' fundus images can be taken by the technician with the help of an ordinary digital camera attached to a slit lamp and sent the images to the base hospital for opinion.

10.1.3. Secondary level: Remote diagnosis approach for diabetes centres

Experiments are underway in placing the fundus camera in the diabetologist's office and sending images to the base hospital through the internet. The advantage of this approach is the opportunity to extend the screening by collaborating with other specialists, like diabetologists, to carry out effective screening. Thus patients would be receive this expert consultation without having to make a visit to a tertiary eye hospital.





Aravind has developed a web browser based software, ADRES 3.0 (Aravind Diabetic Retinopathy Evaluation Software). It supports integration of nonmydriatic fundus camera facilitating image capture, structured clinical data using user-friendly interface and simple workflow with appropriate authorisation to access the case sheets. This system has two modules - Client and Provider.

Client: The screening end where the patients' images are captured

Provider: This is the expert end which provides the reading and Grading

Facilities

- Non-mydriatic fundus camera
- ADRES software
- Internet facilities

Human resources

Ophthalmic technician/fundus photographer

10.2. Mobile van screening

The mobile tele-ophthalmology enables the early detection of blinding eye problems like DR in



the diabetic patients by deploying qualified technicians at the screening level to capture high quality images. A mobile van goes to rural areas or to physicians' offices where patients diagnosed with diabetes at that site are screened in the mobile van.

A mobile van is equipped with a non-mydriatic camera to capture fundus (retinal) images and a video slit lamp to capture images of anterior segment (front of the eye). This equipment is connected to a computer and to the video-conferencing unit. Images thus captured are sent to the Reading and Grading centre located at the base hospital. The ophthalmic images and their digital case sheets are electronically sent through VSAT connectivity at 384 KBPS.

These images are read and graded by trained graders. From the grader's input for each image, the software automatically elicits the severity level along with advice for treatment in a report format. This information is relayed back immediately to the camp site where the report is printed and given to the patient who then receives counselling based upon the report. The turn around time for the whole process is around one hour.

CHAPTER 11

Costing for DR Services

11.1. Cost involved in clinical procedures

The cost for the clinical procedures is based on the cost involved in delivering the DR services for each different level of care. The table below provides the list of equipment and instruments required and the cost associated in deploying the above resources to deliver DR services.

The table below indicates the additional (minimum) resources required for establishing DR services

| Additional (Minimum) resource requirements | | | | | |
|---|-----------------------------|--------------------------------|--------------------------------|--------------------------------|----------------------|
| Category Equipment | Make & Model | Level of service | | | Assumed |
| | | Screening (Primary) | Medical (Secondary) | Surgical (Tertiary) | Unit cost Rs. |
| Indirect Ophthalmoscope with 20D lens | Heine - Sigma 150 | 0 | 1 | 4 | 45,000 |
| 78 D lens | Volk | 1 | 1 | 4 | 6,500 |
| Fluorescein Angiography including Retinal Camera & Imagnet System | Topcon -TRC 50 DX | 0 | 1 | 1 | 1,400,000 |
| Diode Laser/Green Laser(GL) | Iridex -USA | 0 | 1 | 0 | 1,200,000 |
| Vitrectomy Console | Alcon - Accrus | 0 | 0 | 1 | 2,400,000 |
| VR surgical instruments | Indo -German Surg. | 0 | 0 | 1 | 600,000 |
| Frequency Doubled YAG Laser with endolaser probe/ indirect ophthalmoscope & Slit Lamp delivery with all accessories | Carl Zeiss - Visulas- 532 s | 0 | 0 | 1 | 2,000,000 |
| Surgical Operating Microscope with CCTV Attachment & Observerscope | Carl Zeiss - Visu-140/S1 | 0 | 0 | 1 | 1,700,000 |
| Digital Camera with Slit Lamp Adapter | Aravind - Model | 1 | 0 | 0 | 15,000 |

| | | | | | |
|-------------------------------|--|--------|----------------|------------------|--------|
| Investment in equipmentRs. | | 21,500 | 2,651,500 | 8,306,000 | |
| Human resource | | | | | |
| Nurse | | 0 | 1 | 3 | 6,000 |
| Counsellor | | 0 | 1 | 2 | 5,000 |
| Technician | | 0 | 1 | 1 | 7,500 |
| Retina consultant/surgeon | | 0 | 0 | 2 | 40,000 |
| Field coordinator | | 0 | 1 | 1 | 6,000 |
| Annual salary cost Rs. | | - | 294,000 | 1,458,000 | |

Service costing at secondary level: The cost has been calculated for secondary level service

| Service costing at secondary level | | | |
|---|------|-----------|-------------|
| Costs | Rate | Rs. | Assumptions |
| Investment in equipment | | 2,651,500 | |
| Cost of capital | 12% | 318,180 | |
| Depreciation (life time 5 years) | 20% | 530,300 | |
| Annual maintenance contract cost | 4% | 106,060 | |
| Manpower cost | | 294,000 | |
| Total Fixed cost | | 1,248,540 | |
| Variable cost per laser procedure | | 10 | |
| Variable cost per out-patient examination | | 100 | |

| Utilization levels | | | | |
|---|-------|---------|---------|---|
| | Low | Medium | Optimum | |
| Out-patients examined for DR per day | 20 | 30 | 60 | |
| DR laser procedures per day | 2 | 4 | 8 | |
| Total working days in the year | | 300 | | |
| Out-patients examined for DR per year | 6,000 | 9,000 | 18,000 | |
| DR laser procedures per year | 600 | 1,200 | 3,000 | |
| Fixed cost element for OP Examinations | | 312,327 | | 90% of the HR Cost is assigned for this & 5% of the equipment related fixed costs |
| Fixed cost element for Laser Procedures | | 936,213 | | The remaining fixed costs |
| Cost per patient treated | Rs. | | | |
| OP Examination | 152 | 135 | 117 | |
| Laser procedure | 1,570 | 790 | 400 | |

11.1.1. Fixed cost

The workings for the fixed cost for one time investment for a Secondary level is as follows

1. Equipment cost is calculated with 12% interest of the total cost of the equipment per year.
2. The depreciation is calculated as 20% per year on the equipment assuming the life time as five years.
3. The AMC charge is calculated as 4% on the equipment per year.
4. The cost towards the total manpower is calculated for one year.

11.1.2. Variable cost

Theoretically the variable cost varies with the output (out patients and laser procedures). On an average it is assumed as Rs.10/- per day for consumables used for laser procedure and Rs.100/- per day for out patient examination.

Cost of services is based on the utilisation of the resources and the volume of workload.

11.1.3. Utilisation level

The costs of the services are arrived at by considering the degree of utilisation of the resources at various levels. The utilisation of the resources is based on the workload per day is indicate as below:

There are three levels of utilisation of the resources.

1. Low: The outpatients examined for DR is 20 cases per day and laser procedure is for 2 cases per day.
2. Medium: The outpatients examined for DR is 30 cases per day and laser procedure is for 4 cases per day
3. Optimum: The outpatients examined for DR is 60 cases per day and laser procedure is for 8 cases per day

11.1.4. Costing of services

1. Low: The cost of OP consultation is Rs.152/- per patient and the cost of laser procedure is Rs. 1570/- per patient

2. Medium: The cost of OP consultation is Rs.135/- per patient and the cost of laser procedure is Rs. 790/- per patient
3. Optimum: The cost of OP consultation is Rs.117/- per patient and the cost of laser procedure is Rs. 400/- per patient

Note: Higher number of lasers done will lower the cost per patient.

11.2. Cost involved in awareness creation activities

- a. Designing and printing cost of health education materials
- b. Awareness programme cost

a. Designing and printing cost of Health education materials

Health education materials help to provide current information and messages about the disease.

1. Pamphlet: Provide basic information about the disease to understand the importance of regular eye care and for better health seeking behavior.
2. Booklet: Provide in-depth information about DR Used for educating paramedical personnel and medical personnel who have some degree of preexisting medical knowledge.
3. Posters: Intended to raise general awareness in the community about DR. Displayed in clinics, medical shops, hospitals, primary health centres (PHCs)
4. Handbills: Provide key messages about the disease and explain the importance of regular eye care and of laser treatment.

b. Awareness programme cost

11.3. Costing heads for awareness programme

11.3.1. Exhibitions, Diabetic Fairs

Manpower requirements– 2 (Field coordinators)

1. Designing and printing charges of posters /charts/ models etc.,
2. Pamphlets and handbills

3. Table 10 numbers and chairs – 2 numbers
4. Exhibition hall rent
5. Exhibition decoration cloth
6. Banner (About the institution and name of the exhibition) - 2
7. Pre exhibition activity publicity expenses
8. Field coordinator travel and food expenses for 2 days
9. Stationery and contingencies
10. Food & tea expenses for team members during the exhibition
11. Suggestion note and pen
12. Vehicle transportation charges from the institution to Exhibition site (up and down)

11.3.2. Press meeting

1. Press meeting pre arrangements (Travel and meals, phone)
2. Registration note - 1
3. Banner - 1
4. Hand outs /press release / brochure/pamphlets
5. Stationery expenses (note pad and pen)
6. Lap top and LCD projector - 1
7. Tea, Snacks (or) meals for press people
8. Photos
9. Meeting hall rent
10. Mementos
11. Mike set

11.3.3. Seminars (Doctors, Paramedical Personnel and NGO/others)

Manpower requirements (Retina specialist - 1; Project officer-1- IEC Expert-1; Field coordinator -1; Administrative assistant - 1)

1. Field coordinator travel and food expenses for 2 days for seminar pre arrangement
2. Phone
3. Postage
4. Stationery (Note pad, pen, Registration note)
5. Seminar hall rent

6. Handouts – Booklet/Pamphlets
7. Tea, Snacks, Lunch
8. Lap top and LCD projector - 1
9. Mementos for guests (Joint Director of Health Services/Deputy Director of Health Services)
10. Charges for Photo developing and printing for documentation

11.3.4. Health education at PHCs and taluk hospitals

Manpower requirement – 1 Field coordinator

1. Field coordinator travel and food expenses for pre arrangements
2. Postage
3. Handouts – Pamphlets
4. Flip chart - 1

11.3.5. Patient and doctors interaction session

Manpower requirement (Retina specialist – 1; Field coordinator – 1; Administrative Assistant - 1)

1. Auditorium
2. Message board – 15 to 20 numbers
3. Handouts – Pamphlets
4. LCD projector – 1
5. Lap top - 1

11.3.6. Guest lecture

Manpower requirement (Retina specialist - 1; IEC Expert -1; Field coordinator – 1; Administrative Assistant - 1)

1. Field coordinator's travel and food expenses for pre-arrangements
2. Phone
3. Meeting hall
4. Handouts – Pamphlets and booklets
5. LCD projector – 1
6. Lap top – 1
7. Banner - 1

Note: Better to have one LCD Projector and Lap top for the awareness programmes

11.4. Community outreach DR screening camp

Camp team: Field coordinator - 1; Nurse - 7 (Tension/IOP; to assist doctor; Dilatation; Height & weight; Blood pressure; Lab; Vision) Doctors 2 or 3; Counsellor – 1 and Driver -1)

1. Field coordinator's travel and meals expenses for fixing camps
2. Travel and meals expenses for camp site visit by Field coordinator
3. Phone
4. Van hire charges
5. Printing materials of hand bills for distribution
6. Publicity expenses – Auto propaganda, local cable TV, Newspaper advertisement, Radio announcement, Cinema theatre slides, village tam tam etc.,
7. Camp consumables (Dilating drops, medicines, battery cell, Camp OP card, register)

8. Glucometre, Blood strips, needle, syringes, spirit and cotton for diabetes screening
9. Medical team food expense (Breakfast, Tea, Lunch)
10. Banner – 2
11. Message board – 50 numbers

11.4.1. Cost involved in conducting DR Screening camps

The Diabetic Retinopathy camp is organised by the local voluntary organisation/clubs/diabetologist/general physician, in collaboration with the eye hospital. They are called camp sponsors (Persons who organise camp). They take some responsibilities in organising the camp for the benefit of the community. It is most important to discuss with the sponsors the minimum cost for conducting a camp at the initial discussion, because these type of camps are less expensive than cataract camps. The eye hospital provides care of the medical team materials cost and transport cost for the camp.

1. Sponsor responsibility (Person who organise camp)

| S.No | Activities | Medium size camp (Expected diabetic OP 125-150) | | Large size camp (Expected diabetic OP 200- 250) | |
|------|---|--|------------|--|------------|
| | | Numbers | Amount Rs. | Numbers | Amount Rs. |
| 1 | Pamphlet/hand bills printing Rs.250 per 1000 | 5,000 | 1,250 | 10,000 | 2,500 |
| 2 | Posters printing charges 100 Nos. x Rs. 6/- | 100 | 600 | 250 | 1,500 |
| 3 | Auto charges for mike publicity for 1 day x Rs.800/- per day | 1 Day | 800 | 2 Days | 1,600 |
| 4 | To put message boards at 4 important places. (Hire and writing charge Rs.50/- x 4 boards) | 2 | 300 | 4 | 600 |
| 5 | Cinema Theatre slides 15 days prior to camp date | 1 | 200 | 1 | 200 |
| 6 | Cable TV 15 days prior to the camp date | 1 | 300 | 1 | 300 |
| 7 | A4 size Fluorescent board to put at medical and tea shops, labs and hospitals, hotels and petty shops 100 | | | | |

| S.No | Activities | Medium size camp (Expected diabetic OP 125-150) | | Large size camp (Expected diabetic OP 200- 250) | |
|------|--|---|------------|---|------------|
| | | Numbers | Amount Rs. | Numbers | Amount Rs. |
| 8 | Nos, x Rs.2.50/- To collect addresses of the diabetic patients from local labs and hospitals and send post cards for each diabetic patient approx. 100 patients x Rs.0.50 | 50 | 125 | 100 | 250 |
| 9 | Charge for newspaper agent to insert bit notice in major newspapers for 3 days x Rs.50/- per day | 100 | 50 | 200 | 100 |
| 10 | Blood strips Rs.20/- per strip | 3days | 150 | 5 days | 250 |
| 11 | Medical team hospitality for 12 members | 300 | 6,000 | 500 | 10,000 |
| 12 | Additional expenses | 12 | 600 | 15 | 750 |
| | Total | | 500 | | 500 |
| | | | 10,875 | | 18,550 |

2. Eye Hospital responsibility

| S. No | Activities | Cost for medium size camp (Rs.) |
|-------|---|---------------------------------|
| 1 | Cost for Medical Team (1 Man day) Doctors (2x Rs. 5000), Paramedical personnel (8xRs.200), Field Coordinator (1x Rs.500), Driver (1x Rs.150) | 12,250 |
| 2 | Materials cost: (OP cards, Dilating drops, spirit, dettol,etc.,) | 500 |
| 3 | Van hire | 1,500 |
| | Total | |

CHAPTER 12

Programme Management

The programme management is coordinated through one organisation/hospital. All the activities are implemented by the organisation/hospital as a project at the initial level. After completion of the project, the entire activities are carried out by the respective organisation/hospitals as regular activities.

12.1. Guidelines for programme management

Phase 1 Pre Planning

Collection of baseline information: Before the commencement of the Diabetic retinopathy project in a district, the Project Manager collects the baseline information of that area and carries out the pre planning activities as mentioned below:

- Project service area population (2001)
- Number of districts
- Name of the districts
- Number of taluks
- Addresses of the district medical and health officers
- Deputy director of public health
- Deputy director of medical and family welfare
- Number of PHCs and name of the PHCs
- Number of health sub centres (HSCs) and name of the HSCs
- Date of monthly review meeting day of the medical officers and supervisors at district level
- Weekly review meeting of the PHCs
- Indian Medical Association (IMA) list
- Date and place of the president and secretary meeting
- Diabetologists name and address

- Awareness meeting date and time
- Leading hospitals with addresses
- Name and addresses of the Press
- Different partners (Lions clubs, Rotary clubs, NGO, Women's group, Youth club)

These details help the institutions to implement the DR activities with the coordination, cooperation and commitment at all levels in the community.

12.2. Phase-2 Planning

Activity planning

- Develop an Activity chart. This chart contains the list of activities with time line (divided into different phases) and persons responsible for the activities.
- Develop a Milestone and target chart for the project period.
- Develop standardised systems and procedures (costs for expenses, reporting formats-(monthly, quarterly and final reporting formats both internal and external) with the persons responsible for managing, each stage of the project.
- Planning meeting with the senior management team to decide on the implementation of the project.

12.2.1. Manpower planning

- Do a proper planning of the manpower requirements of the project.
- Recruit and select the members of the project team at the implementing centre.
- Prepare training curriculum and the training schedule for the field staff (Training curriculum

and the schedule for training can be framed according to the different cadres of the project).

12.2.2. Development of cash flow and accounts reports

- Develop cash flow statements for the project.
- Prepare cost centre heads for the budget heads and present it to the accounts department for preparing the cost centre.
- Prepare specific accounting manual for the project.

12.2.3. Prepare an operational manual

- Develop an operations manual for the project.
- Develop detailed job responsibilities for members at each levels of the project.
- Organise an orientation workshop for all the members and stakeholders of the project.
- Develop a geographical information system (GIS) for the project in order to identify service area/catchment area for the project and to obtain Baseline information on the project area.

12.3. Phase-3 Implementation

Infrastructure development

- Infrastructure development for the project (project office, training centre,)
- Create manual filing system and allot separate files for different heads. (proposal & budget, correspondence, reports, etc.,)
- Purchase equipment and consumables as per the budget.
- Label the project equipment and maintain a stock inventory.

12.3.1. Training of project staff

- Training of the project team at the implementation centre and at the central office.
- Follow the protocol strictly as per the manual of operations for the project.

12.3.2. Accounting procedures

- All project bills (internal/payment bills) are subject to approval from the project head.
- All project bills/vouchers should be filed separately.
- Monthly project accounts statement should be prepared by the accountant, based on the budget heads with the help of the project manager.

Implementation of the activities

12.3.3. Development of IEC materials

- Develop new materials, tools and templates (e.g., designing case sheets, referral cards, health education guide, IEC materials – brochures, pamphlets, booklets and posters, management Information system etc.,) for community based projects.
- Implementation: Awareness creation, and community outreach camps plans are implemented as per the project plan in the respective project districts with a formal inauguration.

Phase 4 Monitoring and reporting

12.4. Monitoring

- Advance Tour Programme (ATP) schedule is submitted by the field staff to the project manager on a weekly basis.
- The project coordinator conducts meetings on a weekly basis with the project staff/field staff in the respective implementation centre (Field/Project office). The field visit programme is reviewed by the project manager based on the ATP.
- The project coordinator conducts meetings on a monthly basis with the project staff/field staff in the respective implementation centre. The chief medical officer (CMO)/head monitors/reviews the performance of the project during this meeting.

- Quarterly review meetings are organised with the members of the senior management team, together with the heads of the project, the project manager, the project coordinator and field staff/project staff. The policy level decision or issues (selection/replacement of staff, salaries, purchase of equipment, protocol) regarding the project are sorted out during this meeting.
- Periodic visits are made by the project manager to the field /project office at the implementation centre.
- The project manager gets monthly performance report and statement of accounts and reviews them.

12.4.1. Reporting

- Prepare physical performance report / interim report and finance report on a quarterly/half yearly basis according to the needs of the funding agency.
- The reports prepared and submitted to the funding agency as per the templates/format given by the funding agency.
- The accounts /annual audit is done during the end of the financial year.
- The auditing statement is submitted to the funding agency as per the requirements.

- A hard copy of the final report is sent after project completion according to the deadline fixed by the funding agency. An electronic version is also sent through email/CD to the funding agency.

(Please see Annexure-6 performance report - Table 1 to 4. Please see Annexure - 7 monthly income & expenditure statement)

Phase 5 Documentation and dissemination

12.5. The following elements are documented in a project.

- Regular challenges faced in the implementation of the activities.
- Impact analysis and process analysis of the project
- Learning experiences.
- Modules on project strategies.
- Videos
- Presentations through slides.
- Paper clippings
- Hard copies of the project documents and reports are filed in a separate box file for further references.

12.6. Recommendations

Some basic recommendations for establishing DR services:

- The hospital should have infrastructure and manpower for DR services

12.6.1. Awareness creation

- Awareness is very important for success of the DR services
- Before creating awareness the baseline survey (Knowledge, Attitude, Practice - KAP study) should be conducted
- Awareness creation is to be conducted for the medical personnel, paramedical personnel, Non Governmental Organisations and different partners
- Awareness creation is a continuous process
- A well planned awareness programme should be conducted before the camp
- Organise mega exhibition/rally, awareness programme with specialists, screening camp during important days like World Diabetes Day – November 14.
- Publish articles in the local newspapers about diabetes and diabetic retinopathy. Newspaper articles can effectively spread information to those who are literate.
- Telecast diabetes and diabetic retinopathy messages over radio and television periodically.
- Put up scrolling boards with key messages on diabetes and diabetic retinopathy in important places. This approach reaches a large audience.

12.6.2. Community outreach

- DR screening camp is one of the opportunities for awareness creation
- The diabetic care centres are only in the big cities but the majority of the population lives in rural areas. DR camps may be conducted in both rural and urban areas.
- Camps organised in association with diabetologists and any community partner like

Lions, Rotary and Association are more successful and yield more diabetic patients than those camps organised without collaborators.

- It is better to organise exclusive diabetic retinopathy screening camp to yield more number of diabetic patients.
- The random blood glucose test, rather than the urine test, is the better method for use in community screening camps.
- Before the DR camp, distribution of hand bills and notices to the diabetic patients attending out patient departments at the government district hospitals and government taluk hospitals will create an awareness about the diabetic retinopathy camp.
- Counselling should be provided in the DR screening camp

12.6.3. Secondary/Tertiary care level

- The Patients - Doctor interaction session may be conducted in the base hospital. This is an opportunity for the patients and attendees to discuss their concerns with the doctor.
- Prepare and send a mass mailing to all diabetic patients to maintain good follow-up care.
- Laser treatment may be given free of cost to the eligible cases (poor patients)
- Strengthen counselling at the base hospital.
- Referred patients from the DR camps should receive followup central through written letters.

12.6.4. Project management

- It is better to have a exclusive Diabetic Retinopathy project team (project manager, field coordinator, IEC coordinator/IEC expert and data entry operator)
- Periodical planning and monitoring, coordinating will improve the DR service performance

12.6.5. Networking

- Involve local volunteers, Youth clubs, and Women's organisations in the area. It is the best approach to get community participation.

13. Strategy for control of Blindness related to DR in the community under NPCB

1. Create awareness about diabetes mellitus in the community. The early symptoms of polydipsia and polyuria need to be highlighted. People with a family history of diabetes need to undergo blood glucose testing.
2. Create awareness about ocular complications of diabetes mellitus in the population.
3. The General physicians, who are the first contact for the vast majority of the population, need to be oriented. The importance of early detection needs to be emphasised. The relationship between uncontrolled diabetes and retinal changes requires special mention.
4. The primary care physicians need to be supported by a strong referral system. The diabetics referred by them should be properly examined by the ophthalmologists
5. Laser facilities have to be available and accessible
6. The role of primary care physicians in ensuring regular follow-up of the diabetics is of paramount importance.

| |
|---|
| <h4>Prevention of Blindness from Diabetes</h4> |
|---|

- | |
|---|
| <ol style="list-style-type: none">1. Early detection of diabetes2. Good control of diabetes3. Early detection of eye disease4. Facilities and trained personnel to provide laser treatment and follow-up |
|---|

Source: Manual on Diabetic Retinopathy published by National Programme for Control of Blindness (NPCB) by Dr.Lalit Verma, Dr. Pradeep Venkatesh, Dr. H.K. Tewari, Dr. G.V.S. Murthy, Dr. Sanjeev K. Gupta.

Table 2**Annexure 6**

**DIABETIC RETINOPATHY PROJECT
COMMUNITY OUTREACH**

Report for the Month of _____

| Community outreach | | Total Target (Year – 1) | Current Month | | Cumulative | | % of Achive | Remarks if any |
|--|-------------------------------|----------------------------|---------------|-------|------------|-------|-------------|----------------|
| | | | Target | Achiv | Target | Achiv | | |
| Exclusive Diabetic Retinopathy Screening camp | No.ofDR Camps conducted | | | | | | | |
| | Out Patients screened (OP) | | | | | | | |

Report for the current month_____

| Community outreach | Diabetic OP | | DR diagnosed | | Advise & Referral | | Remarks if any |
|--|-------------|-----|--------------|-----|-------------------|-----|----------------|
| | Known | New | Known | New | Laser | FFA | |
| Exclusive Diabetic Retinopathy Screening camp | | | | | | | |

Cumulative report for the period from_____

| Community outreach | Diabetic OP | | DR diagnosed | | Advise & Referral | | Remarks if any |
|--|-------------|-----|--------------|-----|-------------------|-----|----------------|
| | Known | New | Known | New | Laser | FFA | |
| Exclusive Diabetic Retinopathy Screening camp | | | | | | | |

Table: 3**Annexure: 6****DIABETIC RETINOPATHY PROJECT**

Tertiary Care Centre at _____

Monthly Report for the month of _____

| Tertiary care | Total Target Y1 | Current month | | Cumulative | | Remarks |
|----------------------------------|-----------------|---------------|--------|------------|--------|---------|
| | | Target | Achiev | Target | Achiev | |
| Diabetic outpatient | | | | | | |
| Diabetic Retinopathy outpatient | | | | | | |
| Laser treatment No.of persons | | | | | | |
| No.of Laser Procedures | | | | | | |

Table: 4**Annexure: 6****DIABETIC RETINOPATHY PROJECT**

Academic Training Programmes at _____

Monthly Report for the month of _____

| Type of Academic Programme | Total Target Y1 | Current month | | Cumulative | | Remarks |
|---|-----------------|---------------|--------|------------|--------|---------|
| | | Target | Achiev | Target | Achiev | |
| No.of Long term fellows to be trained | | | | | | |
| No.of Short term fellows to be trained | | | | | | |
| No.of FFA & USG technicians to be trained | | | | | | |

Monthly Income and Expenditure statement for the month of _____ Annexure: 7

| Particulars | Funding Agency | | | | | | |
|---|-------------------------|--------|----------|-------------|--------|----------|-----------------------|
| | For the Month of Oct'07 | | | Upto Oct'07 | | | % Funds Utilised |
| | Budget | Actual | Variance | Budget | Actual | Variance | |
| I. RECURRING EXPENSES: | | | | | | | |
| A. Awareness Creation: | | | | | | | |
| IEC & Education Materials | | | | | | | |
| Exhibitions, Diabetic Fairs etc., | | | | | | | |
| Seminars (Doctors) | | | | | | | |
| Seminars (Paramedical) | | | | | | | |
| Seminars (Others) | | | | | | | |
| Press Meetings | | | | | | | |
| Sub Total (A) | | | | | | | |
| B. Service Delivery: | | | | | | | |
| Community Outreach Screening | | | | | | | |
| Consumables for Diabetes patients | | | | | | | |
| Tertiary Care | | | | | | | |
| Sub Total (B) | | | | | | | |
| C. Human Resources: | | | | | | | |
| Staff Salaries | | | | | | | |
| Sub Total (C) | | | | | | | |
| D. Other Administrative expenses: | | | | | | | |
| Travel | | | | | | | |
| Communication | | | | | | | |
| Miscellaneous | | | | | | | |
| Sub Total (D) | | | | | | | |
| TOTAL RECURRING EXPENSES (A to D) | | | | | | | |
| II. NON-RECURRING EXPENSES: | | | | | | | |
| E. Equipments: | | | | | | | |
| Sub Total (E) | | | | | | | |
| TOTAL NON-RECURRING EXPENSES (F) | | | | | | | |
| Total expenditure (Recurring & Non recurring) (G) | | | | | | | |
| RECEIPTS: | Rupees | | | | | | Remarks if any |
| A. Funds Received from Funding agency | | | | | | | |
| A.1 Bank Interest | | | | | | | |
| A.2 Institution Contribution if any | | | | | | | |
| Total Receipts (A) | | | | | | | |
| B. Total Expenditure (G) | | | | | | | |
| Balance (A-G) | | | | | | | |



VISION 2020 The Right to Sight INDIA

S-390, Double Storey, Ground Floor

New Rajinder Nagar

New Delhi - 110 060

India

www.vision2020india.org



ARAVIND EYE CARE SYSTEM



World Health Organisation
Collaborating Centre
For Prevention of Blindness