KNOWLEDGE AND AWARENESS ABOUT DIABETES MELLITUS AND DIABETIC RETINOPATHY IN SUBURBAN POPULATION OF SOUTH INDIAN STATE AND ITS PRACTICE AMONG THE PATIENTS WITH DIABETES MELLITUS: A POPULATION-BASED STUDY

Conducted by

SSM RESEARCH FOUNDATION
in association with
GIRIDHAR EYE INSTITUTE
&
JAI BHARATH ARTS AND SCIENCE COLLEGE, PERUMBAVOOR

ACKNOWLEDGEMENTS

CONTENTS

CHAPTERS:

ACKNOWLEDGEMENT

Let us thank God Almighty, the most merciful for his blessings to make this study a reality.

We would like to express our sincere gratitude to the President of Chengamanad Grama Panchayat for giving as an opportunity to fulfill this study and thanks to all the panchayat members and people for the valuable support rendered.

We wish to express our deep sense of gratitude to Dr. George K Philip, Head of the Social Work Department, Jai Bharath Arts & Science College, Perumbavoor for his valuable guidance from the beginning to the completion of this work and his knowledge and feedback helped us a lot.

We express our sincere thanks to all the students of Social Work Department and National Service Scheme of Jai Bharath College, Perumbavoor for the inestimable assistance.

Last but not the least we express our heartfelt gratitude to Dr. Giridhar and the entire GEI family who helped and support for this study.

CHAPTER 1
INTRODUCTION

According to the World Health Organization (WHO), 347 million people worldwide have diabetes mellitus. In 2013, the International Diabetes Federation reported 65 million people with diabetes mellitus in India between the age groups of 20 and 79 years. Among the 57 million deaths that occurred globally in 2008, 36 million were due to non-communicable diseases such as cardiovascular diseases, cancers, diabetes mellitus, and chronic lung diseases. The WHO projects that diabetes mellitus will be the seventh leading cause of death by 2030. Macro- as well as micro vascular complications secondary to diabetes mellitus account for the increased burden of the disease. Diabetic retinopathy is one such complication known to occur in all people with diabetes mellitus over time. The WHO estimates diabetic retinopathy to account for 4.8% of the global causes for blindness. The prevalence of diabetic retinopathy in India has been reported to range from 7.3% to 25%.

Early detection and timely intervention of diabetic retinopathy, being a silent disease, are important for its management. Adequate control over blood sugar levels and associated risk factors are essential in prevention and management of diabetic retinopathy. Creating an awareness regarding the disease and its potential complications can prompt patients to approach the medical personnel with an aim of disease control.

According to the 2011 census, Kerala is one of the states in India with the highest literacy rates. However, despite the literacy levels and various diabetes mellitus–related health programs, ocular complications due to diabetes mellitus were found to be on the rise. Thus, we realized that being literate alone does not translate into knowledge and awareness regarding a particular disease. This study was conducted in one of the suburban towns of Kerala to assess the knowledge and attitude of the general population regarding diabetes mellitus and diabetic retinopathy with an aim to understand the strengths and shortcomings in our present awareness programs. This study is unique in that it is a first population based assessment wherein data was collected from all the households by a door-to-door survey.

CHAPTER 2
REVIEW OF LITERATURE

DIABETES MELLITUS

Diabetes mellitus (DM) is a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both. The chronic hyperglycemia of diabetes is associated with long-term damage, dysfunction, and failure of various organs, especially the eyes, kidneys, nerves, heart, and blood vessels

There are three main types of diabetes mellitus:

Type 1 DM: is a consequence of body's failure to produce enough insulin. This form was previously referred to as "**insulin-dependent diabetes mellitus" (IDDM)** or "**juvenile diabetes**".

Type 2 DM: occurs due to failure to respond to the insulin as a result of insulin resistance. As the disease progresses a lack of insulin may also develop. This form was previously referred to as "**non insulin-dependent diabetes mellitus" (NIDDM)** or "**adult-onset diabetes**". Obesity and lack of exercise are known to be contributory factors.

Gestational diabetes: occurs as a consequence of hormonal changes in pregnancy, resulting in high blood glucose level.

CURRENT STATUS OF DIABETES IN INDIA:

Diabetes mellitus is fast gaining the status of a potential epidemic in India with more than 62 million diabetic individuals currently diagnosed with the disease. In 2000, India (31.7 million) topped the world with the highest number of people with diabetes mellitus followed by China (20.8 million) and the United States (17.7 million) in second and third place respectively. It is predicted that by 2030 diabetes mellitus may afflict up to 79.4 million individuals in India, while China (42.3 million) and the United States (30.3 million) will also see significant increases in those affected by the disease.

The etiology of diabetes in a developing country like India is multifactorial and includes genetic factors, environmental influences, raised living standards, steady urban migration, and lifestyle changes as a result of urbanization.

Preliminary results from a large community study conducted by the Indian Council of Medical research (ICMR) revealed that a lower proportion of the population is affected in states of Northern India (Chandigarh 0.12 million, Jharkhand 0.96 million) as compared to Maharashtra (9.2 million) and Tamil Nadu (4.8 million). The National Urban Survey conducted across the metropolitan cities of India reported similar trend: 11.7 per cent in Kolkata (Eastern India), 6.1 per cent in Kashmir Valley (Northern India), 11.6 per cent in New Delhi (Northern India), and 9.3 per cent in West India (Mumbai) compared with (13.5 per cent in Chennai (South India), 16.6 per cent in Hyderabad (south India), and 12.4 per cent Bangalore (South India) populations. The disparities can be attributed to the ethnic and lifestyle differences across the states.

In India, the urban population has access to reliable screening methods and anti-diabetic-medications; however the rural patients do not have easy access to these. This can be attributed to the disproportionate allocation of health resources between urban and rural areas. Such inadequacies have resulted in poor diabetes management due to inaccessibility to health care .Inadequate screening programs and the financial burden have further made detection and follow up of diabetic patients difficult.

Though at present, HbA1c is the gold standard test for the diagnosis of diabetes mellitus and the initiation of insulin, it is not easily available to a large section of Indian population. An inadequacy in Indian guidelines is also responsible for wide variation in treatment preferences across the country.

An upsurge in number of early-onset diabetes cases is also responsible for the development of various diabetic complications due to longer disease duration; however data on the prevalence of diabetic complications across the whole of India is scarce.

A recent international study reported that diabetes control in individuals worsened with longer duration of the disease (9.9±5.5 years), with neuropathy the most common complication (24.6 per cent) followed by cardiovascular complications (23.6 per cent), renal issues (21.1 per cent), retinopathy (16.6 per cent) and foot ulcers (5.5 per cent).These results were closely in line with other results from the South Indian population. Poor glycemic control, a factor that has been observed in

the Indian diabetic population, has been observed to be mainly responsible for micro- and macro vascular changes that present with diabetes, and can predispose diabetic patients to other complications.

All diabetic patients develop retinopathy in course of time, the prevalence being proportional to the duration of diabetes. The Diabetic Retinopathy Study (DRS) and Early Treatment Diabetic Retinopathy Study (ETDRS) have conclusively advocated the role of regular eye examination to ensure early detection and treatment of diabetic retinopathy and prevention of severe visual loss. Individuals with type 2 diabetes are recommended to have a dilated eye examination at the time of diagnosis and annually there after. The awareness and adherence to this periodic eye check up is poor even in highly literate and educated population in developed countries like Japan and USA. So the scenario in developing countries like India where the literacy level is much lower is expected to be worse. These factors highlight the need for population based diabetic retinopathy awareness and prevalence detection studies in developing countries. These studies will help in the proper planning and allocation of funds in a useful manner for prevention of diabetic retinopathy complications.

Unlike other states in India, Kerala has high health care indices and literacy rate. There is no strict division of urban and rural areas in Kerala. The statistics show that the literacy rate is 90.92% and infant mortality rate is 14 per 1000 live births in Kerala. This is at par with developed countries. Despite awareness campaigns and literacy, complications due to diabetic retinopathy were on the rise further emphasizing the need for strengthening existing programs and aggressive public motivation.

DIABETIC RETINOPATHY

Diabetic retinopathy is the result of damage to the tiny blood vessels that nourish the retina. They leak blood and other fluids that cause swelling of retinal tissue and clouding of vision. The condition usually affects both eyes. The longer a person has diabetes, the more likely they will develop diabetic retinopathy. If left untreated, diabetic retinopathy can cause blindness.

Diabetic retinopathy is the most frequent cause of new cases of blindness among adults aged 20–74 years. During the first two decades of disease, nearly all patients with type 1 diabetes and >60% of patients with type 2 diabetes have retinopathy. In the Wisconsin Epidemiologic Study of Diabetic Retinopathy (WESDR), 3.6% of younger-onset patients (type 1 diabetes) and 1.6% of older-onset patients (type 2

diabetes) were legally blind. In the younger-onset group, 86% of blindness was attributable to diabetic retinopathy. In the older-onset group, in which other eye diseases were common, one-third of the cases of legal blindness were due to diabetic retinopathy.

In patients with diabetes, prolonged periods of high blood sugar can lead to the accumulation of fluid in the lens inside the eye that controls eye focusing. This changes the curvature of the lens and results in the development of symptoms of blurred vision. The blurring of distance vision as a result of lens swelling will subside once the blood sugar levels are brought under control. Better control of blood sugar levels in patients with diabetes also slows the onset and progression of diabetic retinopathy.

NATURAL HISTORY OF DIABETIC RETINOPATHY

Diabetic retinopathy progresses from mild non-proliferative abnormalities, characterized by increased vascular permeability, to moderate and severe nonproliferative diabetic retinopathy (NPDR), characterized by vascular closure, to proliferative diabetic retinopathy (PDR), characterized by the growth of new blood vessels on the retina and posterior surface of the vitreous. Macular oedema, characterized by retinal thickening from leaky blood vessels, can develop at all stages of retinopathy. Pregnancy, puberty, blood glucose control, hypertension, and cataract surgery can accelerate these changes.

Vision-threatening retinopathy is rare in type 1 diabetic patients in the first 3–5 years of diabetes or before puberty. During the next two decades, nearly all type 1 diabetic patients develop retinopathy. Up to 21% of patients with type 2 diabetes have retinopathy at the time of first diagnosis of diabetes, and most develop some degree of retinopathy over time. Vision loss due to diabetic retinopathy results from several mechanisms. Central vision may be impaired by macular oedema or capillary non-perfusion. New blood vessels of PDR and contraction of the accompanying fibrous tissue can distort the retina and lead to tractional retinal detachment, producing severe and often irreversible vision loss. In addition, the new blood vessels may bleed, adding the further complication of pre-retinal or vitreous haemorrhage. Finally, neovascular glaucoma associated with PDR can be a cause of visual loss.

Often there are no visual symptoms in the early stages of diabetic retinopathy. That is why the American Optometric Association recommends that everyone with diabetes have a comprehensive dilated eye examination once a year. Early

detection and treatment can limit the potential for significant vision loss from diabetic retinopathy. Some of the symptoms of diabetic retinopathy include:

Seeing spots or floaters in your field of vision:

- Blurred vision
- Having a dark or empty spot in the center of your vision
- Difficulty seeing well at night

WHAT CAUSES DIABETIC RETINOPATHY?

Non-proliferative diabetic retinopathy (NPDR) is the early state of the disease in which symptoms will be mild or non-existent. In NPDR, the blood vessels in the retina are weakened causing tiny bulges called micro aneurysms to protrude from their walls.

Proliferative diabetic retinopathy (PDR) is the more advanced form of the disease. At this stage, new fragile blood vessels can begin to grow in the retina and into the vitreous, the gel-like fluid that fills the back of the eye. The new blood vessel may leak blood into the vitreous, clouding vision.

Vision loss is mainly due to:

- Fluid can leak into the macula, the area of the retina which is responsible for clear central vision. Although small, the macula is the part of the retina that allows us to see colors and fine detail. The fluid causes the macula to swell, resulting in blurred vision.
- In an attempt to improve blood circulation in the retina, new blood vessels may form on its surface. These fragile, abnormal blood vessels can leak blood into the back of the eye and block vision.

RISK FACTORS FOR DIABETIC RETINOPATHY:

- **Diabetes** — people with Type 1 or Type 2 diabetes are at risk for the development of diabetic retinopathy. The longer a person has diabetes, the more likely they are to develop diabetic retinopathy, particularly if the diabetes is poorly controlled.
- **Race** — Hispanic and African Americans are at greater risk for developing diabetic retinopathy.
- **Medical conditions** — persons with other medical conditions such as high blood pressure and high cholesterol are at greater risk.

- **Pregnancy** — pregnant women face a higher risk for developing diabetes and diabetic retinopathy. If gestational diabetes develops, the patient is at much higher risk of developing diabetes as they age.
- RISK FACTORS FOR PROGRESSION:
- Progression of retinopathy is associated with the **severity and length of time that hyperglycemia** exists. If diabetes is diagnosed before the age of 30, the incidence of DR after 10 years is 50%, rising to 90% after 30 years. There is no set glycemic threshold that will predict the presence or otherwise of diabetic retinopathy.
- **Hypertension** and other **cardiovascular risk factors** can influence the onset and progression of retinopathy. There is marked individual variation in susceptibility to retinopathy for a given vascular risk profile.
- **Renal disease**, as evidenced by proteinuria and elevated urea/creatinine levels, is an excellent predictor of the presence of retinopathy.
- **Pregnancy** can be associated with a rapid progression of DR, particularly if:
    - Presence of severe baseline retinopathy.
    - Poor glycemic control at conception, during pregnancy or in the postpartum period.
    - Rapid improvement of diabetic control.
    - The diabetes has been present for a long time.
    - The patient is hypertensive (chronic or pregnancy-induced).

HOW IS DIABETIC RETINOPATHY DIAGNOSED?

Diabetic retinopathy can be diagnosed through a comprehensive eye examination, testing, with special emphasis on evaluation of the retina and macula, may include:

- **Patient history** to determine vision difficulties experienced by the patient, presence of diabetes, and other general health concerns that may be affecting vision
- **Visual acuity measurements** to determine the extent to which central vision has been affected
- **Refraction** to determine the need for changes in an eyeglass prescription
- **Evaluation of the ocular structures, including the evaluation of the retina** through a dilated pupil
- **Measurement of the pressure** within the eye
- Supplemental testing may include:
- **Retinal photography** or tomography to document current status of the retina

- **Fluorescein angiography** to evaluate abnormal blood vessel growth
- The gold standard for diagnosis is dilated retinal photography with accompanying ophthalmoscope if the retinal photographs are of inadequate quality, e.g., cataract clouding view.

CLASSIFICATION OF DIABETIC RETINOPATHY

Diabetic retinopathy is classified into two types:

- **Non-proliferative diabetic retinopathy** (NPDR) is the early state of the disease in which symptoms will be mild or non-existent. In NPDR, the blood vessels in the retina are weakened causing tiny bulges called micro aneurysms to protrude from their walls. The micro aneurysms may leak fluid into the retina, which may lead to swelling of the macula.

- **Proliferative diabetic retinopathy** (PDR) is the more advanced form of the disease. At this stage, circulation problems cause the retina to become oxygen deprived. As a result new fragile blood vessels can begin to grow in the retina and into the vitreous, the gel-like fluid that fills the back of the eye. The new blood vessel may leak blood into the vitreous, clouding vision. Other complications of PDR include detachment of the retina due to scar tissue formation and the development of raised intraocular pressure resulting in neovascular glaucoma with subsequent optic nerve damage. If left untreated, proliferative diabetic retinopathy can cause severe vision loss and even blindness.

- The classification used in the Early Treatment Diabetic Retinopathy Study (the modified Airlie House classification) is widely used internationally. The following descriptive categories are also in widespread use in clinical practice:

Background diabetic retinopathy (BDR) is characterized by micro aneurysms, dot and blot hemorrhages and exudates. Generally the earlier signs of DR, although persisting as more advanced lesions appear.

Diabetic maculopathy strictly refers to the presence of any retinopathy at the macula, but commonly reserved for significant changes, particularly vision-threatening Oedema and ischemia.

Pre-proliferative diabetic retinopathy (PPDR) manifests cotton wool spots, venous changes, intraretinal micro vascular anomalies (IRMA) and often deep retinal hemorrhages. PPDR indicates progressive retinal ischemia, with a heightened risk of progression to retinal neovascularization.

PDR is characterized by neovascularization on or within one disc diameter of the disc (NVD) and/or new vessels elsewhere (NVE) in the fundus.

Advanced diabetic eye disease is characterized by tractional retinal detachment, significant persistent vitreous hemorrhage and neovascular glaucoma.

Abbreviated Early Treatment Diabetic Retinopathy Study classification of diabetic retinopathy:

Non Proliferative Diabetic Retinopathy (NPDR)

a) No DR

b)Very mild

Micro aneurysms only

c) Mild

Any or all of: micro aneurysms, retinal hemorrhages, exudates, cotton wool spots, up to the level of moderate NPDR. No IRMA or significant beading

d) Moderate

- Severe retinal hemorrhages (more than ETDRS standard photograph 2A: about 20 medium-large per quadrant) in 1–3 quadrants or mild intraretinal micro vascular abnormalities (IRMA)
- Significant venous beading can be present in no more than 1 quadrant
- Cotton wool spots commonly present

e) Severe

The 4-2-1 rule; one or more of:

- Severe hemorrhages in all 4 quadrants
- Significant venous beading in 2 or more quadrants
- Moderate IRMA in 1 or more quadrants

f) Very severe

Two or more of the criteria for severe

Proliferative Diabetic Retinopathy (PDR)

a) Mild-moderate

New vessels on the disc (NVD) or new vessels elsewhere (NVE), but extent insufficient to meet the high-risk criteria

b) High risk PDR

New vessels on the disc (NVD) greater than ETDRS standard photograph 10A (about 1/3rd disc area)
Any NVD with vitreous or pre-retinal hemorrhage
NVE greater than 1/2 disc area with vitreous or pre retinal hemorrhage (or hemorrhage with presumed obscured NVD/E)

TREATMENT OF DIABETIC RETINOPATHY

CONTROL OF SYSTEMIC DISEASES:

Treatment for diabetic retinopathy depends on the stage of the disease and is directed at trying to slow or stop the progression of the disease.

In the early stages of Non-proliferative Diabetic Retinopathy, treatment other than regular monitoring may not be required.

Proper diet and exercise and keeping blood sugar levels well controlled can help control the progression of the disease.

TARGETTED APPROACH TO RETINOPATHY

MEDICAL MANAGEMENT:

LASER:

MACULAR LASER: Laser treatment (photocoagulation) is used to stop the leakage of blood and fluid into the retina. A laser beam of light can be used to create small burns in areas of the retina with abnormal blood vessels to try to seal the leaks.

PAN RETINAL PHOTOCOAGULATION: When blood vessel growth is more widespread throughout the retina, as in proliferative diabetic retinopathy, a pattern of scattered laser burns is created across the retina. This causes abnormal blood vessels to shrink and disappear. With this procedure, some side vision may be lost in order to safeguard central vision. Some bleeding into the vitreous gel may clear up on its own.

SURGICAL MANAGEMENT:

INTRAVITREAL INJECTIONS: Intravitreal injections of anti VEGF (Vascular endothelial growth factors) or steroids have been used for the reduction of edema or swelling in the macula and have been used along with laser treatment. Anti VEGF injections have additional benefit of causing regression of the new vessels and have been used as adjunct prior to vitreous surgery to reduce the intraoperative bleeding.

VITRECTOMY: If significant amounts of blood leak into the vitreous fluid in the eye, it will cloud vision and can prevent laser photocoagulation from being used. A surgical procedure called a vitrectomy may be used to remove the blood-filled vitreous and replace it with a clear fluid to maintain the normal shape and health of the eye.

VISUAL REHABILITATION: Persons with diabetic retinopathy can suffer significant vision loss. Special low vision devices such as telescopic and microscopic lenses hand and stand magnifiers, and video magnification systems can be prescribed to make the most of remaining vision.

SCREENING AND FOLLOW UP OF DIABETIC RETINOPATHY

Screening

By the time diabetic eye problems present with visual problems, the condition may advanced and irreversible. Therefore, effective screening is essential:

- All patients with type 1 diabetes aged 12 years and over must be offered an annual retinal screening examination (or more frequently if clinically indicated).[2]

- All patients with type 2 diabetes aged 12 years and over should be offered an annual retinal screening examination as soon as the diagnosis is made (the diabetes may have been present for a number of years before the diagnosis is made, so there is a greater risk of DR being present at the time of diagnosis).

- Pregnant diabetic women benefit from more frequent screening: Women with diabetes planning pregnancy should be informed of the need for assessment of diabetic retinopathy before and during pregnancy.

- Pregnant women with pre-existing diabetes should be offered retinal assessment by digital imaging following their first antenatal clinic appointment and again at 28 weeks if the first assessment is normal. If any diabetic retinopathy is present, additional retinal assessment should be performed at 16–20 weeks.

- Fluorescein angiograms should be avoided in pregnancy but retinal laser treatment is safe.

- Digital retinal photography with mydriasis should be used as the gold-standard screening test to detect diabetic retinopathy. Photography without mydriasis can be sufficient if no more than one photograph is required.

It's important to identify diabetic retinopathy as soon as possible. Screening is an effective way of detecting retinopathy at an early stage.

If retinopathy is detected early enough, it can be effectively treated using laser treatment. Otherwise, by the time the symptoms of retinopathy become noticeable, it can be much more difficult to treat.

Recommended eye examination schedule for patients with diabetes:

Type of diabetes	**Retinal examination**
Type 1 DM	3-5 years after diagnosis
Type 2 DM	At the time of diagnosis
Gestational DM	Before conception and in first trimester of pregnancy

Follow up schedule is recommended based on the stage of diabetic retinopathy at the time of retinal evaluation:

Category	**Follow up schedule**
Non Proliferative diabetic retinopathy	
No DR	Review in 12 months
Very mild	Review most patients in 12 months

Category	Follow up schedule
Mild	Review range 6–12 months, depending on severity of signs, stability, systemic factors, and patient's personal circumstances
Moderate	Review in approximately 6 months PDR in up to 26%, high-risk PDR in up to 8% within a year
Severe	Review in 4 months PDR in up to 50%, high-risk PDR in up to 15% within a year
Very severe Two or more of the criteria for severe	Review in 2–3 months High-risk PDR in up to 45% within a year
Proliferative diabetic retinopathy (PDR)	
Mild-moderate New vessels on the disc (NVD) or new vessels elsewhere (NVE), but extent insufficient to meet the high-risk criteria	Treatment considered according to severity of signs, stability, systemic factors, and patient's personal circumstances such as reliability of attendance for review. If not treated, review in up to 2 months
High-risk	Treatment should be performed immediately when possible, and certainly same day if symptomatic presentation with good retinal view

Prognosis:

- Background retinopathy will eventually progress to the more severe forms in the majority of individuals. If left untreated: 50% of those with proliferative DR will lose their sight within 2 years and 90% risk losing any useful vision after 10 years.
- Patients who undergo treatment have their risk of moderate visual loss reduced from 30% to 15% over the subsequent 3 years. Those who have pan-retinal photocoagulation have their risk of severe visual loss reduced by 50%, compared with untreated individuals with a similar severity of disease.

CHAPTER 3
RESEARCH METHODOLOGY

INTRODUCTION

Diabetic retinopathy is damage to the retina, specifically blood vessels in the retina, caused by complications of diabetes mellitus. Diabetic retinopathy can eventually leads to blindness if left untreated. Approximately 80 per cent of all patients who have had diabetes for at least ten years suffer from some degree of diabetic retinopathy. The retina is the light sensitive membrane that covers the back of the eye. If diagnosed and treated early blindness is usually preventable. Diabetic retinopathy generally starts with out any noticeable change in vision. Hence it is important for diabetes patients to have an eye examination at least once or twice annually. Anybody with either diabetes type 1 or diabetes type 2 can develop diabetic retinopathy. The risk is greater the longer a patient has diabetes and the less controlled his/her blood sugar is.

TITLE:

Knowledge and awareness about diabetes mellitus and diabetic retinopathy in suburban population of south Indian state and its practice among the patients with diabetic mellitus.

UNIVERSE OF THE STUDY:

All people with diabetes mellitus (of any age) as well as the general population above 40 years of age in the Chengamanad Panchayat of Ernakulam district were included in this study

TOOL DATA COLLECTION:

An Interview schedule was used for the purpose of data collection.

METHODOLOGY:

The questionnaire was read out to them slowly, and the responses of each individual were marked on a separate questionnaire by the MSW students. At the end of the survey, the entire data were meticulously entered onto a personal computer, and the responses were analyzed using the SPSS, version 16 (SPSS Inc., Chicago, IL).

RESEARCH DESIGN:

A door-to-door cross-sectional survey was carried out in May 2013 in the Chengamanad Panchayat (Ernakulam, Kerala). According to the 2001 census,

Chengamanad had 7,275 total households with a total population of 29,576, which includes 14,475 males and 15,101 females. Of the total population, 25,132 were literate. We were assisted by 90 Master of Social Work (MSW) students of Jai Bharat College of Arts and Science in our survey. They were divided into 45 groups of 2 students each and sent to the households for collecting the survey data.
A thorough literature search was conducted and a Knowledge, Attitude, and Practice (KAP) questionnaire was prepared in English. A pilot study was conducted at our institute to acquaint the students with the questionnaire and to assess their reliability in data collection. After incorporating some minor modifications, a final 30-point questionnaire was prepared with 18 questions aimed at assessing the knowledge and attitude of the entire population and an additional subset of 12 questions for self-proclaimed patients with diabetes mellitus to assess their practice in addition to knowledge and attitude.

DATA ANALYSIS:

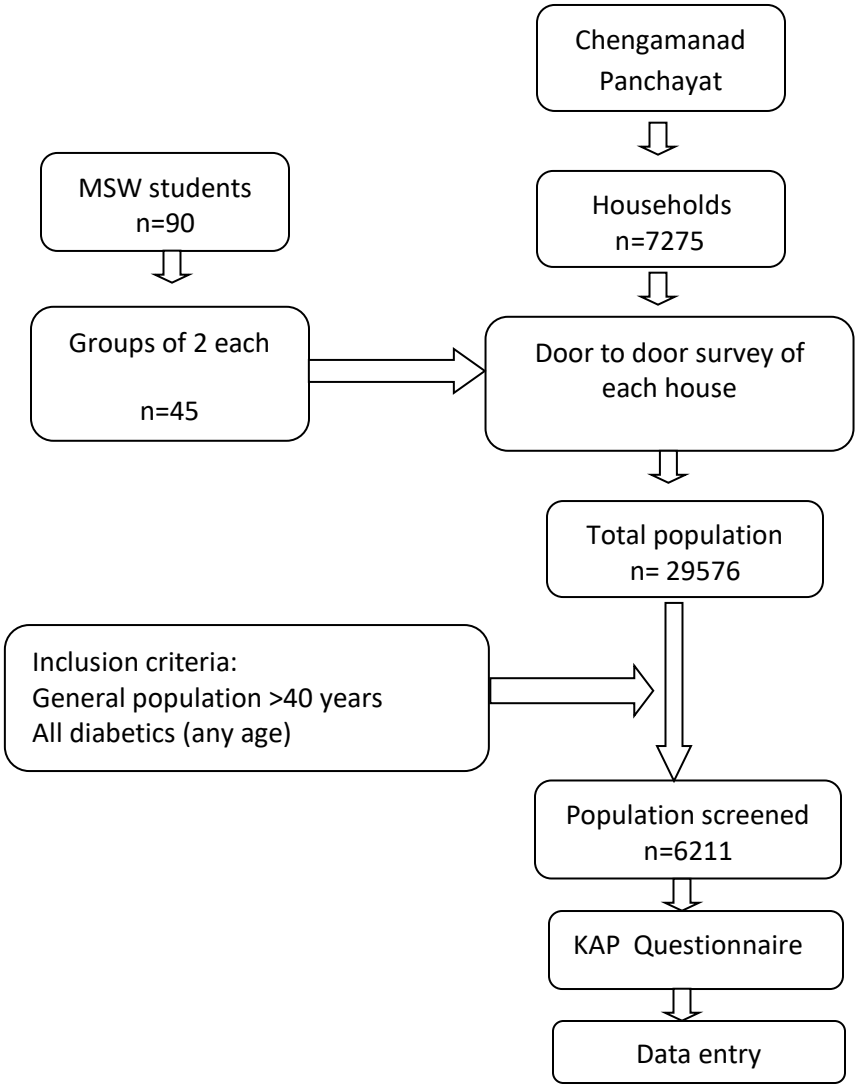
The knowledge questions were assigned scores depending on the correct responses. Correct responses were denoted as +1 and incorrect responses as –1, and 0 if the person was unaware of the response. For multiple-choice responses, scores were assigned from 0 if the person was unaware of the response to 1 for each correct response. The response for each question was summed up and the scores were found to be ranged from 0 to 3. The sum of the scores of all the questions denoted the knowledge score of each individual, which ranged from minimum –14 to maximum score of +12. The median knowledge score was calculated, and the population was divided into two groups: those with "good knowledge" and those with "poor knowledge."

The attitude questions were mainly designed to study the prevailing attitudes and the misconceptions among the population. The responses of the people were recorded in terms of extent of agreement to a particular statement on the five-point Likert-type scale (strongly disagree, moderately disagree, undecided, moderately agree, and strongly agree). The responses were assigned scores with 0 for the undecided value and positive and negative scores for the values around it, depending on the accuracy of the response. Thus, all the scores were summed up to derive the attitude score of the population. The attitude scores ranged from minimum –20 to maximum score +20. Similar to the knowledge score, the population was divided into those with "positive attitude" and "negative attitude" based on the median score.

Patients with diabetes mellitus were given an additional subsection to determine their practice in addition to their knowledge and attitude. Each question under each category was assigned scores, and the maximum score of each patient with diabetes mellitus was calculated. The range of scores for knowledge, attitude, and practice of the patients with diabetes mellitus was −2 to 5, −2 to 10, and −1 to 11, respectively. The patients were also classified into groups based on their median KAP scores.

The study adhered to the Principles of Declaration of Helsinki, and was approved by the ethics committee of our institute.

Figure 1 : Flow chart depicting the recruitment for the survey



CHAPTER 4

RESULTS

The data was transferred onto a computer and analyzed statistically

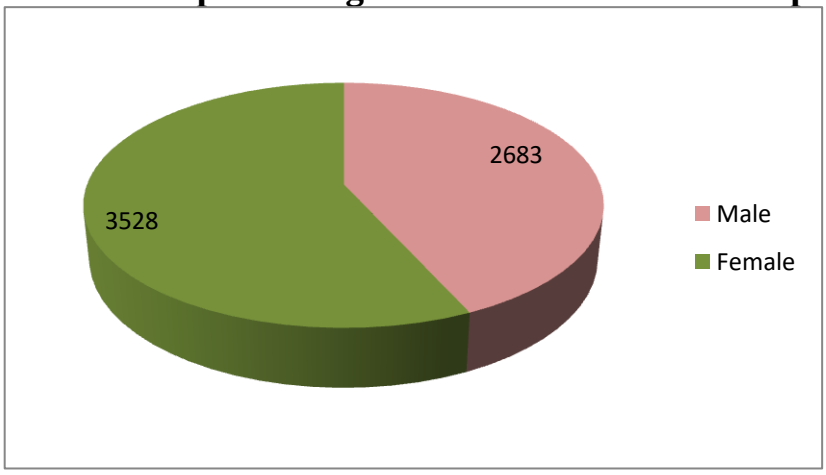
DEMOGRAPHICS

In this study, 6,211 people (3,528 [56.7%] women and 2,683 [43.2%] men) with a mean age of 55.6 ± 11.7 years (range 21–98 years) were included.

Table 1: Sex distribution of the population

S No	Gender	Frequency	Percentage
1	Male	2683	43.2
2	Female	3528	56.8

Graph 1 Pie chart representing the sex distribution of the population

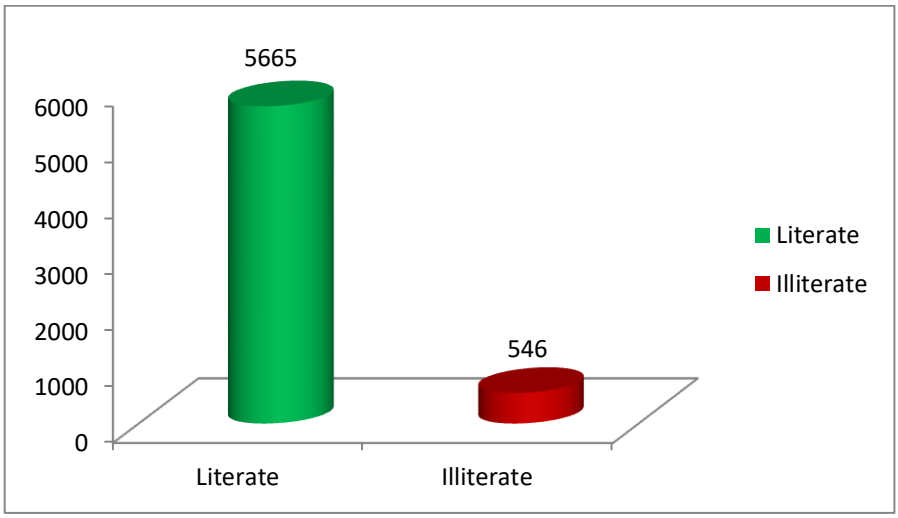


Among them, 5,665 (91.2%) were literate with 4,564 (73.5%) having minimum school education, and the remaining 546 (8.8%) were illiterate (Table 1). Among the literate population, women (3,147) outnumbered the men (2,518).

Table 2: Table depicting the percentage of literate population:

S No	Literacy	Frequency	Percentage
1	Literate	5665	91.2
2	Illiterate	546	8.8

Graph 2: Bar chart representing the literacy levels of the population



Of the interviewed people, only 2,910 (46.86%) had some source of income, with majority of the population working for daily wages (1,563 [25.1%]).

Table 3: Depicting the various sources of Income in the population.

S No	Income Source	Frequency	Percentage
1	Business	450	7.2
2	Agriculture	274	4.4
3	Daily Wages	1219	19.6
4	Professional	234	3.8
5	Others	4034	64.9

Of the participants, 2,225 (35.8%) had availed health insurance facility; 3,604 (58.02%) had sought previous eye consultations, with 3,264 (52.5%) among them being spectacle users.

Table 4 : Proportion of people availing Health Insurance

S No	Health Insurance	Frequency	Percentage
1	Yes	2225	35.8
2	No	3986	64.2

63.3% of the population gave history of prior eye consultation for some or the other ocular condition with refractive error being the most common.

Table 5 : Population with history of prior eye treatment

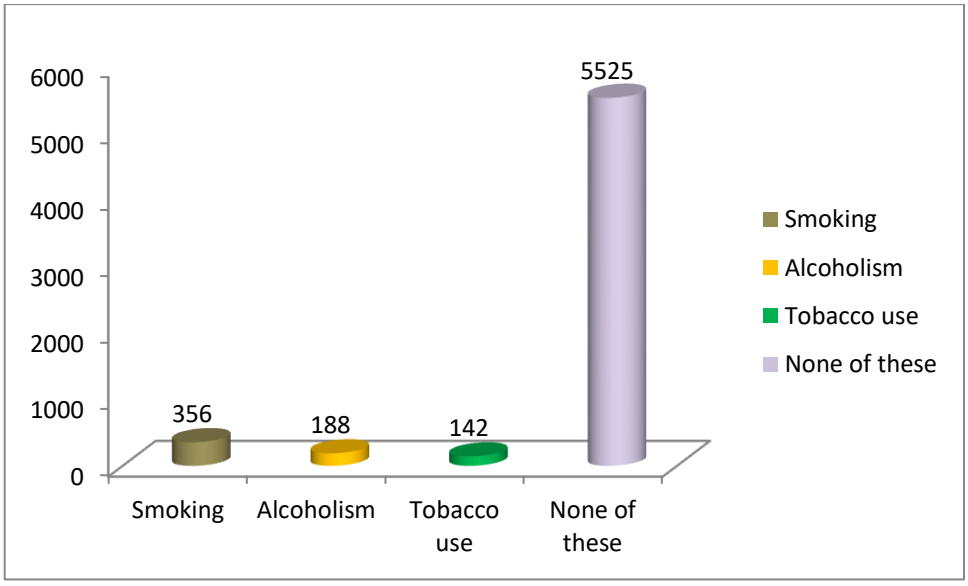
S No	Treatment for Eye	Frequency	Percentage
1	Yes	2279	36.7
2	No	3932	63.3

Though smoking and alcohol consumption are commonly seen social habits in the state of Kerala, a good percentage of the study population (88.9%) did not have either of the habits.

Table 6 : Social habits seen among the study population

S No	Habits	Frequency	Percentage
1	Smoking	356	5.7
2	Alcoholism	188	3
3	Tobacco use	142	2.3
4	None of these	5525	88.9

Graph 3 : Bar chart depicting the Social habits among the study population

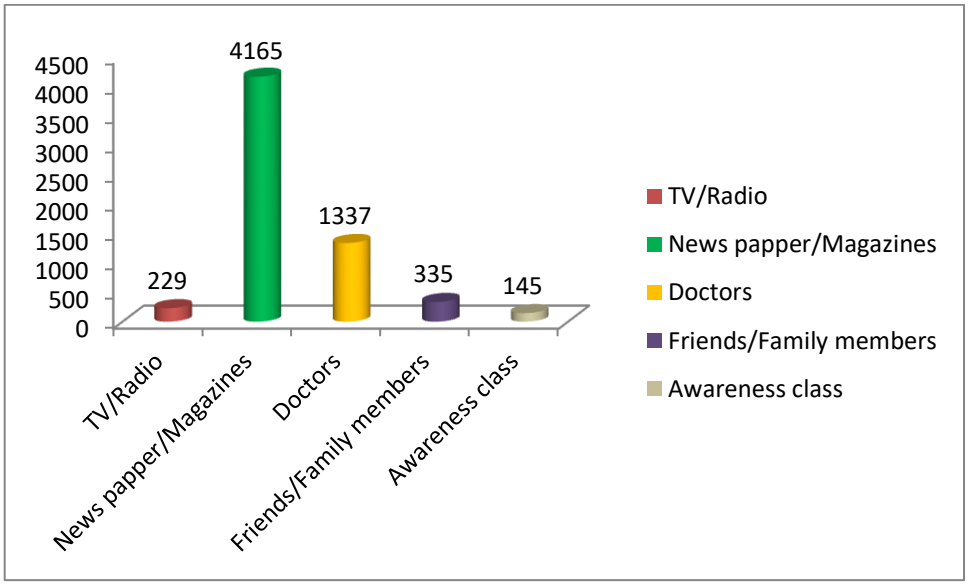


Though media such as television (*n* = 1,312 [21%]) and newspapers (*n* = 1,522 [24%]) contributed to public awareness, family members and friends (3,047 [49%]) followed by doctors (2,117 [34%]) were the major source of information about the disease.

Table 7: Source of information regarding diabetes amongst the population.

S No	Source of information	Frequency	Percentage
1	TV/Radio	229	3.7
2	News Paper/Magazines	4165	67.1
3	Doctors	1337	21.5
4	Friends/family members	335	5.4
5	Awareness class	145	2.4

Graph 4: Bar chart representing the source of information regarding diabetes amongst the population.



KNOWLEDGE LEVELS:

The average knowledge score of the general population was 6.69 ± (range 4–15). A total of 1,647 (26.5%) people were totally unaware of the symptoms of diabetes mellitus, whereas only 1,008 (16.2%) were aware of all the symptoms.

Approximately 2,898 (46%) of the people knew that retinopathy was related to the duration of diabetes mellitus.

Table 8: Knowledge of population regarding the symptoms of Diabetes

S No	Knowledge of population regarding the Symptoms	Frequency	Percentage
1	Increased thirst	1647	26.5
2	Non healing wound	2558	41.2
3	Increased urination	998	16.1
4	Not aware	1008	16.2

Table 9: Knowledge of people regarding the part of the body mainly affected by diabetes

S No	Knowledge of population regarding the affected part of the body	Frequency	Percentage
1	Liver, Intestine	135	2.2
2	Heart, Lungs, All of the above	408	6.6
3	Kidney, Eyes	3631	58.5
4	Not aware	2037	32.8

However, 4,944 (79.6%) people were aware of the fact that diabetes mellitus could be identified by blood and urine tests, and 5,291 (85.2%) had the knowledge regarding the treatment methods for controlling diabetes mellitus.

Though only 745 (12%) people knew about the location of a structure called retina, retinopathy as a consequence of diabetes mellitus was surprisingly known to 4,431 (71.3%) people.

Table 10 Proportion of people aware of the fact that Diabetes can affect the eye

S No	Diabetes affect eye	Frequency	Percentage
1	Yes	4431	71.3
2	No	231	3.7
3	Not aware	1549	24.9

68.9% of the population has heard about the various treatment modalities for the treatment of diabetic retinopathy.

Table 11 Awareness regarding the treatment methods for diabetic retinopathy:

S No	Treatment Methods	Frequency	Percentage
1	Laser	56	0.9
2	Injection	132	2.1
3	Surgery	1744	28.1
4	All the above	4279	68.9

The people were divided into "good" and "poor" knowledge groups, which were then analyzed statistically using the χ^2-test for association with variables such as sex, literacy, history of eye treatment, and presence of health insurance. A *p*-value of <0.05 was considered to be statistically significant.

Thus, 3,457 (55.6%) people were found to possess good knowledge and 2,754 (44.3%) constituted the group with poor knowledge.

Female sex ($p < 0.001$), literate population ($p < 0.001$), those with history of eye consultation ($p < 0.001$), and those without health insurance facility ($p < 0.001$) were found to have significantly better knowledge regarding the disease.

Table 12: Association between the knowledge levels of the population and the demographic variables.

Variable	**Knowledge**		
	Good	**Poor**	**P value**
Sex			
Male	1600 (59.6%)	1083 (40.4%)	
Female	1857 (52.6%)	1671 (47.4%)	**<0.001**
Education			
Literate	3298 (58.2%)	2367 (41.8%)	
Illiterate	159 (29.1%)	387 (70.9%)	**<0.001**
Health Insurance			
Yes	1157 (52%)	1068 (48%)	**<0.001**
No	2300 (57.7%)	1686 (42.3%)	
Eye treatment			
Yes	2124 (58.9%)	1480 (41.1%)	**<0.001**
No	1333 (51.1%)	1274 (48.9%)	

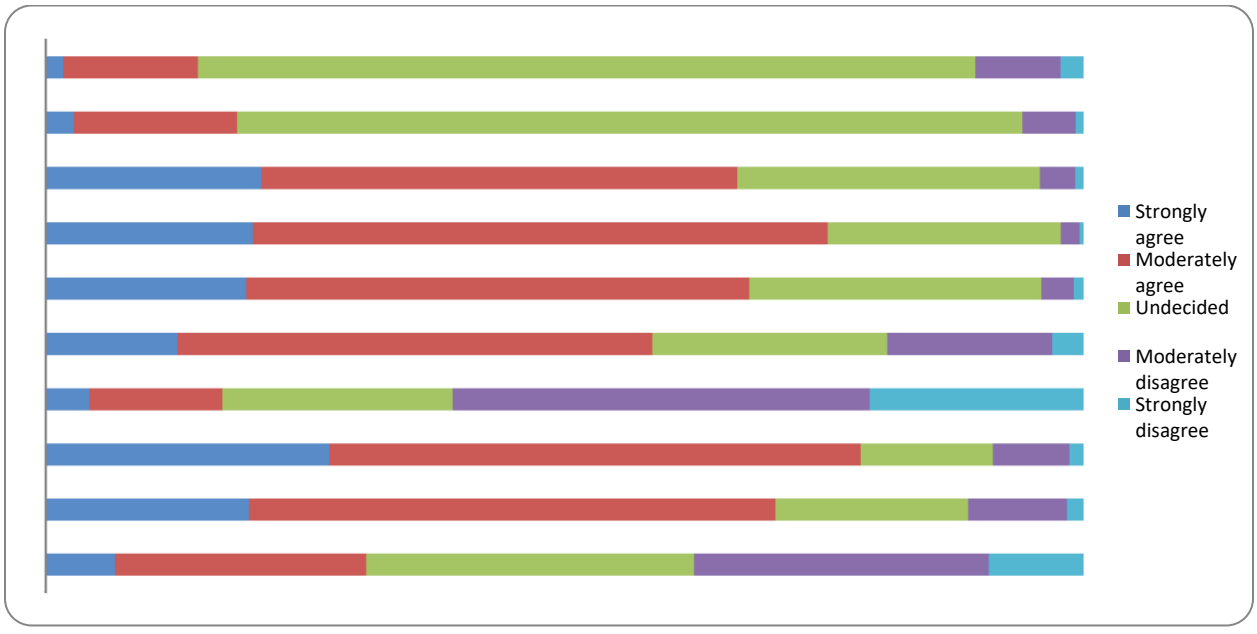
ATTITUDE ASSESSMENT:

The average attitude score of the people toward diabetes mellitus was 3.68 (range –8 to 16), while the median attitude score was 4.Of the total population, 3,280 (52.8%) were observed to have a "positive" attitude whereas 2,931 (47.1%) had a negative attitude toward the disease.

Though misconceptions such as consumption of sweets could lead to diabetes mellitus were seen in a majority of the population (4,875 i.e.79.5%), a good number of them (3,628 [58.4%]) were also aware of other facts such as the role of diet control in diabetes mellitus.

More than half the population i.e. 4,137 (66.6%) people knew that diabetes mellitus could cause blindness and 4,678 (75.3%) strongly felt that the patients with diabetes mellitus should undergo periodic eye checkups.

Graph 5: Bar chart representing the attitude of the population towards diabetes and diabetic retinopathy



When analyzed statistically, literate people ($p < 0.001$) and those with the history of eye treatments ($p < 0.001$) were found to have a better attitude toward the disease compared to their counterparts.

Sex and the presence of health insurance seemed to have no influence on the attitude of the people

Table 13: Association between the attitude of the population and the demographic variables:

Variable	**Attitude**		
	Positive	Negative	P value
Sex			
• Male	1425 (53.1%)	1258 (46.9%)	
• Female	1855 (52.6%)	1673 (47.4%)	0.67
Education			
• Literate	3105 (54.8%)	2560 (45.2%)	
• Illiterate	175 (32.1%)	371 (67.9%)	**<0.001**
Health Insurance			
• Yes	1153 (51.8%)	1072 (48.2%)	0.24
• No	2127 (53.4%)	1859 (46.6%)	
Eye treatment			
• Yes	2014 (55.9%)	1590 (44.1%)	
• No	1266 (48.6%)	1341 (51.4%)	**<0.001**

DIABETIC POPULATION:

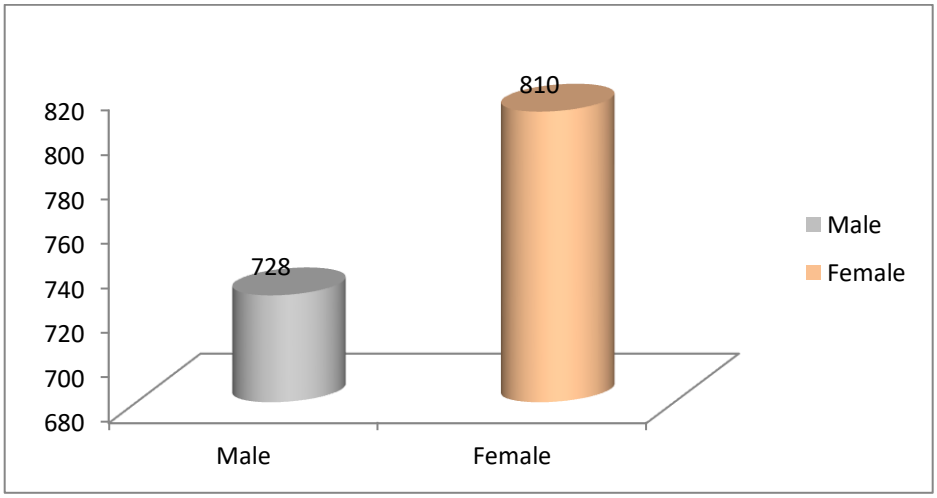
Of the total population, 1,538 (25.4%) were confirmed to be with diabetes mellitus and on its treatment.

Amongst these 728 (47.3%) were males with 810 (52.7%) females outnumbering the males

Table 14 :Sex distribution amongst the diabetic population:

S No	**Sex**	**Frequency**	**Percentage**
1	Male	728	47.3
2	Female	810	52.7

Graph 6: Bar chart representing the sex distribution in the diabetic population:

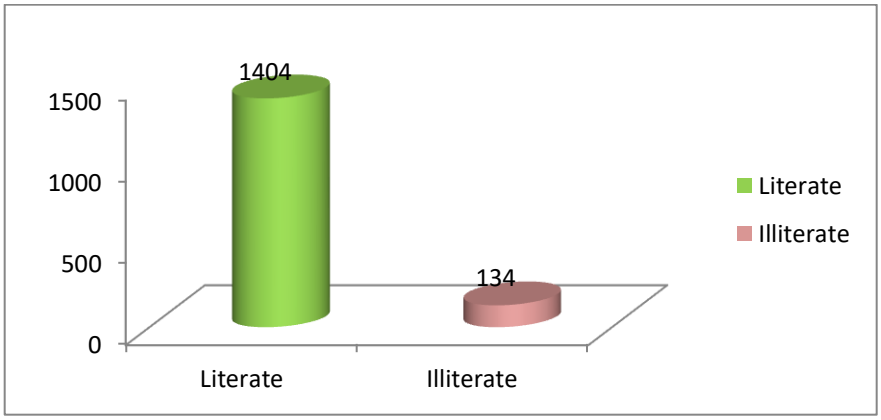


Amongst the diabetic population, 91.3% were literate and having minimal school education at least.

Table 15: Percentage of literate population amongst diabetics.

S No	Sex	Frequency	Percentage
1	Literate	1404	91.3
2	Illiterate	134	8.7

Graph 7: Bar chart representing the proportion of literate Vs illiterate diabetic population:



Amongst diabetics only 33.8% had availed insurance facility, whereas the remaining 66.2% did not have any insurance to cover their medical expenses.

Table 16: Table depicting the percentage of diabetics with Health Insurance facility:

S No	Health Insurance	Frequency	Percentage
1	Yes	520	33.8
2	No	1018	66.2

Only 3.6% of the population were professional and had a steady source of income, while 16.1% worked for daily wages and in 5.2% agriculture was their income source

Table 17: Table depicting the various sources of incomes in the diabetic population:

S No	Income Source	Frequency	Percentage
1	Business	137	8.9
2	Agriculture	80	5.2
3	Daily Wages	248	16.1
4	Professional	56	3.6
5	Others	1017	66.1

52.9% had history of prior visit to eye hospitals with history of undergoing eye treatment for some or the other condition.

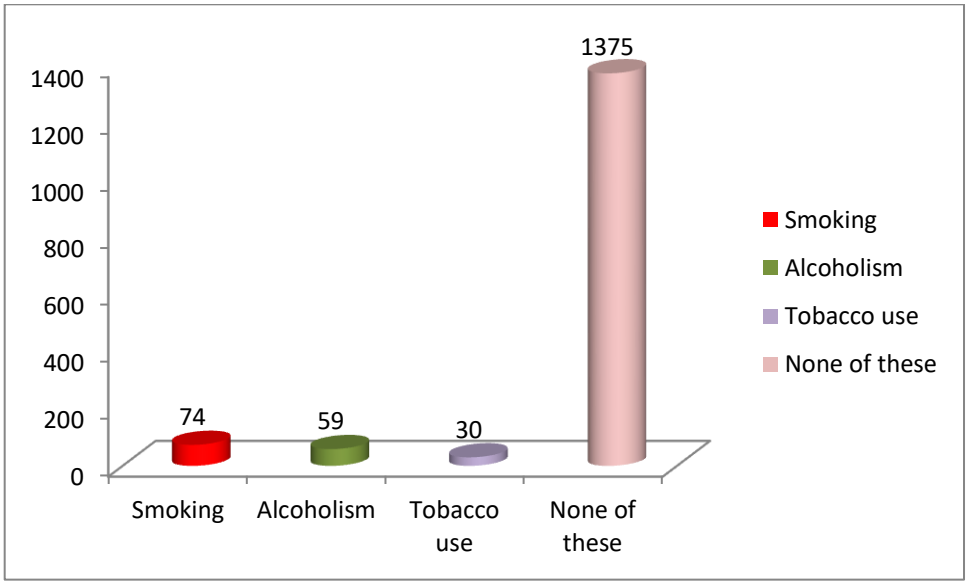
Table 18: Diabetic population with history of prior eye treatment

S No	Treatment for Eye	Frequency	Percentage
1	Yes	724	47.1
2	No	814	52.9

Table 19: Social habits among diabetic population:

S No	Habits	Frequency	Percentage
1	Smoking	74	4.8
2	Alcoholism	59	3.8
3	Tobacco use	30	2
4	None of these	1375	89.4

Graph 8: Bar chart depicting the social habits prevailing among diabetic population:



KNOWLEDGE LEVELS AMONG DIABETIC POPULATION:

64.1% of the diabetics attributed to newspapers and magazines to be the primary source of information regarding the condition. Only 23.9% said they had information regarding the disease from their treating physicians.

Table 20: Source of disease information in the diabetic population:

S No	Source of diabetes information	Frequency	Percentage
1	TV/Radio	40	2.6
2	News Paper/Magazines	986	64.1
3	Doctors	367	23.9
4	Friends/family members	99	6.4
5	Awareness class	46	3

53.1% of the diabetic had been diagnosed during regular health check ups whereas 28.8% were diagnosed following the onset of symptoms.

Table 21: Table depicting the diagnosis of diabetes in these patients:

S No	Method of diagnosis	Frequency	Percentage
1	Symptoms like Increased thirst, Non healing wound, Frequency of urination	443	28.8
2	Health camp	190	12.4
3	Regular health check up	817	53.1

A total of 913 (59.4%) patients had shared their experience with family and friends.

Table 22: Attitude of the diabetics as represented by sharing of their experience with family and friends:

S No	Share experience	Frequency	Percentage
1	Yes	913	59.4
2	No	625	40.6

Only 2.2 % of the population was not following any method for diabetes control while remaining population was controlling diabetes through either medicines and lifestyle modifications or a combination of both.

Table 23: Various methods of controlling diabetes in the population:

S No	Methods of controlling diabetes	Frequency	Percentage
1	Medicines, Diet control	760	49.4
2	Exercise	551	35.8
3	All the above	193	12.5
4	None of these	34	2.2

A very low proportion of them (553 [36%]) said that they had been informed regarding diabetic retinopathy by their treating physician.

Table 24: Treating doctor told you regarding diabetic retinopathy:

S No	Information from treating physician regarding diabetes	Frequency	Percentage
1	Yes	553	36
2	No	985	64

Only 148 (9.6%) people had undergone eye checkups for diabetic retinopathy and 150 (9.8%) were following up frequently; 1,188 (77.2%) people said they would prefer an eye checkup only if they have an eye problem or probably never.

Table 25: Response of diabetics to the question "Have you ever undergone diabetic retinopathy check-up?"

S No	Diabetic eye check up	Frequency	ercentage
1	Yes	148	9.6
2	No	1390	90.4

Table 26: Response of the diabetics to the questions "What is the frequency of eye check up you have?"

S No	Eye check up	Frequency	Percentage
1	Only when there is an eye problem	1188	77.2
2	Once in 2 years	32	2.1
3	Once in a year	168	10.9
4	6 months	150	9.8

- Of the patients with diabetes mellitus, only 619 (40.7%) had good knowledge regarding the disease, 828 (53.8%) had a positive attitude, and 886 (57.6%) believed in good practice methods.
- Surprisingly, 620 (40.3%) knew that poor control of hypertension could worsen diabetic retinopathy.

- Though 57% of them were observed to have good practice patterns with regard to diabetes mellitus control and treatment, they were very ignorant with respect to eye checkups and follow-ups.
- On statistical analysis, literacy showed a significant association with good knowledge ($p < 0.001$), positive attitude ($p < 0.001$), and good practice culture ($p = 0.003$).
- History of eye consultation also showed significant association with possessing good knowledge ($p = 0.008$) and good practice patterns ($p < 0.001$).
- Though overall female population had shown better knowledge, in the diabetic group, men showed a significantly better knowledge ($p < 0.001$) and positive attitude ($p = 0.001$)

Table 27 Factors influencing knowledge, attitude and practice in the diabetic population:

	Knowledge			**Attitude**			**Practice**		
	Good	**Poor**	**P value**	**Positive**	**Negative**	**P value**	**Good**	**Poor**	**P value**
Sex Male Female	334 (45.9%) 285 (35.2%)	394 (54.1%) 525 (64.8%)	**<0.001**	423 (58.1%) 405 (50%)	305 (41.9%) 405 (50%)	**0.001**	432 (59.3%) 463 (57.2%)	296 (40.7%) 347 (42.8%)	0.38
Education Literate Illiterate	592 (42.2%) 27 (20.1%)	812 (57.8%) 107 (79.9%)	**<0.001**	779 (55.5%) 49 (36.6%)	625 (44.5%) 85 (63.4%)	**<0.001**	833 (59.3%) 62 (46.3%)	571 (40.7%) 72 (53.7%)	**0.003**
Health Insurance Yes No	205 (39.4%) 414 (40.7%)	315 (60.6%) 604 (59.3%)	0.63	285 (54.8%) 543 (53.3%)	235 (45.2%) 475 (46.7%)	0.58	290 (55.8%) 605 (59.4%)	230 (44.2%) 413 (40.6%)	0.16
Prior eye treatment Yes No	317 (43.8%) 302 (37.1%)	407 (56.2%) 512 (62.9%)	**0.008**	406 (56.1%) 422 (51.8%)	318 (43.9%) 392 (48.2%)	0.09	464 (64.1%) 431 (52.9%)	260 (35.9%) 383 (47.1%)	**<0.001**

CHAPTER 5
FINDINGS

FINDINGS

- It is well known that prolonged duration of disease results in various disease-associated complications mainly as a result of ignorance and poor disease control, thus contributing to the disease-related morbidity**.**
- Our study revealed good knowledge levels in 55.6% of the population and the fact that about 66.6% knew diabetes mellitus could cause blindness.
- According to the 2011 Indian census, Kerala ranks first in overall (93.9%) and female (91.98%) literacy. Chengamanad in Kerala has an average literacy rate of 80% with female literacy rate of 78%.
- We observed women in the general population to have significantly better knowledge about the disease.
- **Better literacy of our study group, especially higher female literacy, could probably account for the better awareness in our population.**
- However as good knowledge was seen approximately half of the population only, those we can say that being literate does not translate to having disease specific awareness
- In 2002, we had conducted a similar KAP study on the diabetic population alone with a different questionnaire in our outpatient department.
- At that time only 50.8% patients were aware that frequent eye checkups are necessary and only 19% knew about diabetes mellitus affecting the nerves (retinopathy).
- Our survey of the general population 11 years later revealed that 75.3% (4,378/6,211) strongly felt that all patients with diabetes mellitus should undergo periodic eye checkups, and 71.3% were aware of diabetic retinopathy, which reflects that *with time level of awareness has also increased.*
- Literacy and prior visit to eye hospitals significantly showed a positive impact on attitude toward the disease.
- Though some misconceptions were still prevalent in large number of people, a good number of them knew that diabetes mellitus could cause blindness and almost (75%) three-fourths of the population felt the need for periodic eye checkups.
- Sadly, among our diabetic population, the average KAP scores were quite low.
- The knowledge levels were low compared to those of the general population, and only half the population had positive attitude**.**

- The practice patterns seen among the patients with diabetes mellitus in our population also deserve a special mention.
- Though 75% of our general population felt that the patients with diabetes mellitus should undergo frequent eye checkups, only 9.6% of the patients with diabetes mellitus had been checked for diabetic retinopathy and only 9.8 % were on follow-up, which reflects insufficient motivation among patients with diabetes mellitus.
- General practitioners and physicians are usually the first access points of the patients with diabetes mellitus. Only 36% of our people said that they had information from their treating doctors.
- In developing countries such as India, most of the health-care costs are borne by the people.
- This results in economic burden, especially on the lower- and the middle-class citizens. The lack of follow-ups in our population also could be attributed to monetary reasons.

CHAPTER 6
LIMITATIONS OF THE STUDY

LIMITATIONS OF THE STUDY

Our study has a disadvantage that the participants do not constitute a representative sample of the entire state.

However, it does give us a general idea regarding the awareness level of people in a suburban state with a considerably literate population and highlights the shortcomings of the present system.

CHAPTER 7
SUGGESTIONS:

SUGGESTIONS:

- *Diabetic retinopathy in its initial stages need not have any symptoms wherein lies the importance of regular eye checkups for early diagnosis and management.*

- *This is possible only when people are aware of the fact that early detection and timely management can help prevent severe vision loss and blindness due to diabetic retinopathy*

- *Despite good knowledge and attitude, insufficient motivation of the patients with diabetes mellitus for evaluation and follow-ups is a potential barrier in improving their practice patterns.*

- *Low knowledge levels among patients with diabetes mellitus highlight the lacunae of the medical fraternity on imparting disease-specific knowledge to the patients.*

- *Targeting general practitioners, paramedics, and the multipurpose workers at the grassroots levels will go a long way in creating better disease awareness and public motivation, thus helping prevent or delay the onset of diabetes mellitus–related complications.*

- *Involving health policymakers and creating an increased awareness among them regarding the magnitude of the problem may convince them to come up with better insurance coverage for the patients with diabetes mellitus.*

- *This may help allay the economic burden, thus prompting people to seek health-care services rather than avoid due to economic reasons.*

CHAPTER 8
CONCLUSIONS:

CONCLUSIONS:

Better literacy, especially among women, is contributory to better public awareness; however, the trend for poor practice patterns needs to be radically changed with aggressive public motivation emphasizing the necessity of screening for retinopathy and periodic follow-ups.

CHAPTER 9
REFERENCES

REFERENCES

- Global status report on non-communicable diseases 2010. Geneva, World Health Organization, 2011.
- World Health Organization. Prevention of blindness from diabetes mellitus. WHO, Geneva, 2006.
- Joshi SR, Parikh RM. India - diabetes capital of the world: now heading towards hypertension. J Assoc Physicians India. 2007;55:323–4.
- Kumar A, Goel MK, Jain RB, Khanna P, Chaudhary V. India towards diabetes control: Key issues. Australas Med J. 2013;6(10):524-31.
- Wild S, Roglic G, Green A, Sicree R, King H. Global prevalence of diabetes-estimates for the year 2000 and projections for 2030. Diabetes Care. 2004;27(3):1047-53.
- Whiting Dr, Guariguata L, Weil C, Shawj. IDF Diabetes atlas: Global estimates of the prevalence of diabetes for 2011 and 2030. Diabetes Res Clin Pract. 2011;94:311-21
- Anjana RM, Ali MK, Pradeepa R, Deepa M, Datta M, Unnikrishnan R, Rema M, Mohan V. The need for obtaining accurate nationwide estimates of diabetes prevalence in India - rationale for a national study on diabetes. Indian J Med Res. 2011;133:369-80.
- Zargar AH, Khan AK, Masoodi SR, Laway BA, Wani AI, Bashir MI, Dar FA. Prevalence of type 2 diabetes mellitus and impaired glucose tolerance in the Kashmir Valley of the Indian subcontinent. Diabetes Res Clin Pract. 2000;47(2):135-46.
- Ramachandran A, Snehalatha C, Kapur A, Vijay V, Mohan V, Das AK, Rao PV, Yajnik CS, Prasanna Kumar KM, Nair JD; Diabetes Epidemiology Study Group in India (DESI). High prevalence of diabetes and impaired glucose tolerance in India: National Urban Diabetes Survey. Diabetologia.2001;44(9):1094-101.
- Rao CR, Kamath VG, Shetty A, Kamath A. A cross-sectional analysis of obesity among a rural population in coastal southern Karnataka, India. Australas Med J. 2011;4(1):53-57.
- Mohan V, Deepa R. Obesity and abdominal obesity in Asian Indians. Indian J Med Res. 2006;123(5):593-96.
- Misra A, Khurana L. Obesity-related non-communicable diseases: South Asians vs White Caucasians. Int J Obes (Lond). 2011;35(2):167-87.

- Mohan V, Shah S, Saboo B. Current glycemic status and diabetes related complications among type 2 diabetes patients in India: data from the A1chieve study. JAPI (Suppl).

2013; 61:12-15.

- Mohan V, Seshiah V, Sahay BK, Shah SN, Rao PV, Banerjee S. Current status of management of diabetes and glycaemic control in India: Preliminary results from the DiabCare India 2011 Study. Diabetes. 2012;61:a645-a677.
- Rema M, Premkumar S, Anitha B, Deepa R, Pradeepa R, Mohan V. Prevalence of diabetic retinopathy in urban India:The Chennai urban rural Epidemiology Study (CurES)
- Dandona L, Dandona R, Naduvilath TJ, McCarty CA, Rao GN. Population based assessment of diabetic retinopathy in an urban population in southern India. Br J Ophthalmol 1999;83:937–940.
- Rema M,Deepa R,Mohan V Prevalence of retinopathy at diagnosis among type 2 diabetic patients attending a diabetic centre in south India.Br J Opthalmol 2000; 84: 1058-1060.
- Rema M, Premkumar S, Anitha B. Prevalence of diabetic retinopathy in urban India: The Chennai Urban Rural Epidemiology Study (CURES) eye study. Invest Ophthalmol Vis Sci 2005;46:2328-33.
- Raman R, Rani PK, Reddi Rachepalle S, Gnanamoorthy P, Uthra S, Kumaramanickavel G, Sharma T. Prevalence of diabetic retinopathy in India: Sankara Nethralaya Diabetic Retinopathy Epidemiology and Molecular Genetics Study report 2. Ophthalmology. 2009 ;116(2):311-8.
- Namperumalsamy P, Kim R, Vignesh TP, et al. Prevalence and risk factors for diabetic retinopathy: a population-based assessment from Theni District, south India. Br J Ophthalmol 2009; 93: 429–43
- Jonas JB, Nangia V, Khare A, Matin A, Bhojwani K et al.Prevalence and associated factors of diabetic retinopathy in rural central India. Diabetes Care 2013;36: e69
- Mohan D, Raj D, Shanthirani CS, Datta M, Unwin NC, Kapur A, et al. Awareness and knowledge of diabetes in Chennai- The Chennai Urban Rural Epidemiology Study (CURES –9). J Assoc Physicians India. 2005; 53: 283-7.
- Rani PK, Raman R, Subramani S, Perumal G, Kumaramanickavel G, Sharma T. Knowledge of diabetes and diabetic retinopathy among rural populations in India, and the influence of knowledge of diabetic retinopathy on attitude and practice. Rural Remote Health 2008;8:838
- Dandona R, Dandona L, John RK, McCarty CA, Rao GN. Awareness of eye diseases in an urban population in southern India. Bulletin of the World Health Organisation 2001; 79(2): 96-102.

- Deepa M, Bhansali A, Anjana RM, Pradeepa R, Joshi SR, Joshi PP, et al. Knowledge and awareness of diabetes in urban and rural India: The Indian Council of Medical Research India Diabetes Study (Phase I): Indian Council of Medical Research India Diabetes 4. Indian J Endocr Metab 2014;18:379-85.
- Murugesan N, Snehalatha C, Shobhana R, Roglic G, Ramachandran A.Awareness about diabetes and its complications in the general and diabetic population in a city in southern India. Diabetes Res Clin Pract 2007;77:433-7
- Saikumar SJ, Giridhar A, Mahesh G, Elias A, Bhat S.Awareness about eye diseases among diabetic patients: a survey in South India. Community Eye Health. 2007;20(61):16-7.
- Namperumalsamy P, Nirmalan PK, Ramasamy K. Developing a screening program to detect sight threatening diabetic retinopathy in south India. Diabetes Care. 2003; 26:1831-35.
- Padmaja KR, Rajiv R, Pradeep GP, Swati A, Kumaramanickavel G, Sharma T. Use of eye care services by people with diabetes - South India experience. British Journal of Ophthalmology. 2005 (online) Available at http://bjo.bmj.com/cgi/eletters/82/4/410 .
- Namperumalsamy P, Kim R, Kaliaperumal K, Sekar A, Karthika A, Nirmalan PK. A pilot study on awareness of diabetic retinopathy among non-medical persons in South India. The challenge for eye care programmes in the region. Indian Journal of Ophthalmology 2004; 52: 247-251.
- Rajiv R, Pradeep GP, Padmajakumari R, Tarun S. Knowledge and attitude of general practitioners towards diabetic retinopathy practice in South India.Community Eye Health Journal 2006; 19: 13-14.
- http://www.patient.co.uk/doctor/diabetic-retinopathy-and-diabetic-eye-problems

DIABETIC RETINOPATHY SURVEY QUESTIONNAIRE

GENERAL

I. SOCIO DEMOGRAPHIC DATA

1. Name of the Respondent :
2. Age :
3. Sex : Male/Female
4. Ward No :
5. House No :
6. Telephone No./E-mail :
7. Education : a) School b) College c) Professional d) Illiterate
8. Source of Income: : a) Business b) Agriculture c) Daily wages d) Professional e) others
9. Income :
10. Do you have any health Insurance?

a. Yes (Specify ……..)
b. No

11. Do you use spectacles?
    a. Yes
    b. No
12. . Do you ever undergone any treatment for the eye?
    a. Yes b. No
13. Do you have any following habits?
    1. Smoking 2. Alcoholism 3. Usage of tobacco products 4. None of these

Questions regarding Diabetes and Eyes:

14. What are the symptoms of diabetes?
    a) Increased thirst b) Non healing wound c) Increased urination
    d) All of the above e) Not aware
15. Which part of the body is affected mainly by diabetes?
    a) Kidney, eyes, b) Heart, lungs
    c) Liver, intestine d) All of the above
    e) Not aware
16. Diabetes can be identified by
    a) Scanning b) blood and urine test
    c) E.C.G d) All of the above
    e) Not aware
17. What are the treatment methods for diabetes?
    a) Medications b) Diet control
    c) Exercise d) all of the above
    e) Not aware
18. Do you know diabetes affect eye?
    (a) Yes (b) No c) Not aware
19. Where does the retina situate?
    a) In front of the eye b) Back side of the eye c) In pupil
    d) In Optic nerves e) Not aware
20. Which part of the eye is affected mainly by diabetic retinopathy?
    a) Lens b) Pupil c) Retina d) Intra ocular pressure
    e) Not aware
21. Do you know poor control of hypertension worsens diabetic retinopathy ?
    a) Yes b) No c) Not aware
22. What are the methods of treatment of diabetic retinopathy?
    a) Laser b) Injection c) Surgery d) All the above
    e) Not aware
23. What is the symptom of diabetic retinopathy?
    a) Redness of the eye b) Watering
    c) Pain d) Need not have any symptom
    e) Not aware
24. How do you come to know about diabetes?
    a) TV/Radio b) News Paper/Magazines
    c) Doctors d) Friends/family members
    e) Awareness class
25. Do you know that duration of diabetes is related to retinopathy ?
    a) Yes b) No c) Not aware
26. Diabetes can be cured completely'

a) Strongly Agree b) Moderately Agree c) Undecided d) Moderately Disagree
e) Strongly Disagree

27. . Children can be affected if there parents are diabetic
a) Strongly Agree b) Moderately Agree c) Undecided
d) Moderately Disagree e) Strongly Disagree

28. Consuming sweets leads to diabetes
a) Strongly Agree b) Moderately Agree c) Undecided d) Moderately Disagree
e) Strongly Disagree

29. Diabetes is more among rich people
a) Strongly Agree b) Moderately Agree c) Undecided d) Moderately Disagree
e) Strongly Disagree

30. Diabetes can be cured by proper diet control
a) Strongly Agree b) Moderately Agree c) Undecided d) Moderately Disagree
e) Strongly Disagree

31. Diabetics are more likely to develop eye problems than non-diabetics
a) Strongly Agree b) Moderately Agree c) Undecided d) Moderately Disagree
e) Strongly Disagree

32. All diabetics should have a periodic eye examination by an ophthalmologist once in a year
a) Strongly Agree b) Moderately Agree c) Undecided d) Moderately Disagree
e) Strongly Disagree

33. Diabetes can cause blindness
a) Strongly Agree b) Moderately Agree c) Undecided d) Moderately Disagree
e) Strongly Disagree

34. Diabetic retinopathy can be cured with laser treatment
a) Strongly Agree b) Moderately Agree c) Undecided d) Moderately Disagree
e) Strongly Disagree

35. Diabetic retinopathy treatment can regain normal vision
a) Strongly Agree b) Moderately Agree c) Undecided d) Moderately Disagree
e) Strongly Disagree

36. Are you a diabetic ?
a) Yes b) No

Questions for Diabetic patients

37. a. What is the duration of diabetes, in year ……
b. How did you come to know that you have diabetes mellitus ?
1) Increased thirst 2) Non healing wound
3) Frequency of urination 4) Health camp
5) Regular health check up

c. Have you shared your experience regarding diabetes either with your family Members or friends?
a) Yes b) No

d. What treatment you follow to control diabetes?
a) Medicines b) Diet Control c) Exercise
d) All the above f) None of these

e. Have your treating doctor told you regarding diabetic retinopathy?
a) Yes b) No

f. What method of treatment you are following to control diabetes?
a) Ayurvedic b) Allopathy c) Homeo d) Sidha e) Unani

g. Have you ever undergone diabetic retinopathy check up.
1. Yes 2. No

h. Have you every undergone treatment for diabetic retinopathy

Yes (Explain…….)
No

i. What is the frequency of eye check up you have?
   a) 6 months b) Once in a year c) Once in 2 years
   d) Only when there is an eye problem

****