# PREVALENLE OF CO-MORBIDTIES IN TYPE 2 DIABETES MELLITTUS PATIENTS THE AWARENESS LEVEL AND THE IMPACT OF PHARMACIST PATIENT EDUCATION PROGRAMME

261240560

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***Dept. Of Pharmacy Practice***

***JKKMMRF College of Pharmacy***

# INTRODUCTION

Diabetes mellitus (DM) is one of the most common non-communicable disease (NCDs) globally. It is the 4th or 5th leading cause of death in most developed countries and there is substantial evidence that it is epidemic in many economically developing and newly industrialized countries. According to international diabetes federation (IDF) 5th edition of Diabetes Atlas, it is indicated that the number of people living with diabetes is expected to rise from 366 million in 2011 to 552 million by 2030.IDF has also estimated that about 61.3 million people in India are living with diabetes. There are 3 main types of diabetes: Type I, TypeII, and Gestational diabetes mellitus. Type II is the most common form of diabetes and accounts for 90 to 955 of Diabetes cases. Chronic hyperglycemia without proper management can also lead to various short term and long term secondary complications, both of small and big, vascular nature which may be determined as the main cause of mortality and morbidity in type 2 diabetic patients all over the world.

## DEFINITION OF TYPE II DIABETES

Type II diabetes is a chronic metabolic disorder which is characterized by the insulin resistance, impaired islets of beta cell function, and multiple other metabolic or endocrine abnormalities. Because of multifactorial pathogeneses restoration of normoglycemia is difficult to be achieved. This requires many multiple anti diabetic medications that have different mechanism of action and this agent can be used in combination to produce additive effect. A wide range of antibiotic agent with different mechanism of action can also be used to treat diabetes.

## ETIOLOGY OF DIABETES

- Diabetes mellitus which affect people in childhood is known as type II diabetes, they can also be called as non-insulin dependent diabetes, they are commonly affected on the onset of the adolescence. This has become a common disorder that can be characterized by high level of glucose in the blood and other body fluids like urine , it has been found out that the disease occurs mainly due to an increase in the resistance of the body to insulin.

- Many factors has been determined that may lead to diabetes mellitus, or at least that can make this type of diabetes mellitus to a worse condition.

- These factor include, uncontrolled fat deposit in the body (in which around fifty five percent of type 2 diabetes patients are obese at diagnosis) ,high BP, high cholesterol level along with elevated hyperlipidemia and with the condition often determined as metabolic syndrome. There are many other causes also, which may include problems like thyrotoxicosis, Cushing's syndrome, pheochromocytoma, acromegaly chronic pancreatitis and the use of certain other drugs.

- Increased obesity can leads to increased insulin resistance in the body which can easily develop the chance of sudden Type 2 diabetes, most likely cause is that because adipose tissue present mainly in the abdominal region and around the internal organs could be the main source of several chemical signals to other tissues present in the body likes hormones and cytokines.

- the type 2 dm has more possibilities of inheritable genetic connections, which can be received from their parents or other close relatives .

- Mutation to the Islet amyloride Polypeptide gene which can results in an earlier onset, which is a more severe and chronic form of diabetes . Many environmental factors like weight, diet and lifestyle play a big role in the development of the type 2 diabetes, in addition to any genetic or inherited component.

- These may include thiazide diuretics ,atypical anti-psychotic drugs, Calcium channel blockers, corticosteroids, beta blockers, proteaseinhibitors fluroquinones, phenothiazines, somatropin, , etc.

- The mechanisms by which these drugs can lead to an increase in the insulin resistance of the body is different and varies in different drugs.

- High blood sugar level in the body can be a serious condition that can affects practically each and every organ and the organ systems of the body.

- So , a person who is affected to DM should make all possible efforts and changes to their lifestyle so as to keep their blood sugar level in check and control.

**LABORATORICAL INVESTIGATION OF TYPE 2 DIABETES**

- **FASTING PLASMA GLUCOSE : BASIC BUT IMPORTANT**

FPG is the very basic test for DM.FPG is useful for both diagnosis and following up. This is a basic test but it is very important. The pre-analytical factor seems to be strongly affecting the FPG results. The patient preparation must be

gently controlled. It is a requirement toverify the fasting stage of the patients normal value; 70-110mg/dl.

- **POSTPRANDIAL GLUCOSE : AN ALTERNATIVE MEASUREMENT FOR BLOOD GLUCOSE**

Sometimes, the FPG test is not feasible hence the postprandial glucose is examined. This might be another alternative clue for diagnosis of DM. One with abnormal high postprandial glucose level needs further verification by FPG test. The postprandial glucose is an actual application of measurement of chemical in blood with interference (from diet).Normal values: 70-140

- **GLYCATED END PRODUCT: TOOLS FOR MONITORING FOR DIABETIC COMPLICATION**

Glycated end product is a specific in vivo substance that can be generated in caste of poorly controlled DM patients .This is the result from the reaction between proteins in blood (normally hemoglobin or albumin) with excessive glucose in blood. The nature of energy aberration induction of the reaction results in complications of DM

- **INSULIN TEST: A DIRECT MEASUREMENT OF HORMONE**

Insulin is the major hormone in regulation of blood glucose homeostasis. The abnormality of insulin physiology is mentioned as an important underlying for DM, normal value 0.0-24.91U/ml.

When diabetes is not well-controlled, the sugar level in the blood goes up. This is called hyperglycemia. High blood sugar can cause damage to many parts of

the diabetes patient body, especially Kidneys, heart, blood vessels, eyes, feet, nerves. Diabetes can also cause high blood pressure and hardening of the arteries (called arteriosclerosis). These can lead to heart and blood vessel disease.

**HEMOGLOBIN A1C TEST**

The HbA1c test is a laboratory test, which indicates blood glucose control over last three months. HbA1c is formed when glucose in the blood binds irreversibly to hemoglobin to form a stable glycated hemoglobin complex. Since it is irreversible, it stays through out the life span of red blood cells i.e. 90-120 days. Therefore HbA1c testing serves as a reliable indicator of overall glucose control of previous 90 days. Monitoring HbA1c allows doctor to assess long-term compliance with management protocols, such as diet, exercise and medication. The test shows whether the blood glucose is close to normal or too high. An HbA1c test result between 4 to 5.5 % is considered normal. HbA1C value less than 7% in a diabetic means blood glucose is under control. A change in a treatment plan is almost always needed if the test result is over 8%. Studies conducted in people with diabetes have shown that lower the HbA1c number, greater the chance of staying healthy & will slow or prevent the development of serious eye, kidney and nerve disease. People with diabetes should get the HbA1c test at least two times a year if their blood glucose is in the target range and stable. If they are taking insulin, if their treatment changes or if their blood glucose stays too high, they should get the HbA1c test at least every 3 months until their blood glucose level improves. It is important to note that HbA1c testing is not considered as replacement of blood glucose testing. The blood glucose test is very effective and common test for the measurement of glucose

level in the body, HbA1c test value gives an idea of average blood glucose levels over preceding 3 months.

| **HbA1C** | **mg/dl** |
|---|---|
| NORMAL | <5.5 |
| ABNORMAL | >5.5 |
| TREATMENT | >6 |

**ORAL GLUCOSE TOLERANCE TEST**

- Diabetes is diagnosed if glucose level is higher than 200 mg/dl after 2 hours Diabetes screening is recommended.
- Overweight adults (BMI greater than 25) who have other risk factors.
- Adults over age 45 every 3 years.

**MANAGING BLOOD SUGAR BY SELF TESTING**

Self-testing means checking the blood sugar at home themselves. Checking blood sugar levels at home and writing down the results will tell how well is being manage.

A device called a glucometer can give an exact blood sugar reading. There are different types of devices. Usually, pricking the finger with a small needle called a lancet. This gives a tiny drop of blood. Place the blood drop on a test strip and put the strip into the device. Results are given within 30 - 45 seconds.

A health care provider or diabetes educator will help set up an at home testing schedule for the Diabetes patients. The doctor will help to set the blood sugar goals.

- Most people with type 2 diabetes only need to check the blood sugar once or twice a day.
- Check the blood sugar levels few times a week, if the blood sugar levels are under control.
- Self-testing can be done after wake up, before meals, and at bedtime.
- Testing should be done when the patient are sick or under stress.

The results of the test can be used to change patient's meals, activity, or medications to keep blood sugar levels in the right range. Testing can identify high and low blood sugar levels before to attaining serious problems.

Advice the patient to keep a record of blood sugar by themselves and with health careprovider. This will help them to identify whether they are having trouble managing diabetes.

**CO-MORBIDITY**

Co-morbidity is defined as the occurrence of one or more chronic conditions in the same person with an index-disease, occurs frequently among patients with diabetes. Currently, integrated diabetes care programs focus on diabetes-related co morbidities like cardiovascular diseases, retinopathy, nephropathy and diabetic foot.

However, patients with diabetes do not only have diabetes-related co morbidity but also have non diabetes-related co morbidity, such as depression and musculoskeletal diseases. With the ongoing population aging of Western societies, not only the number of patients with diabetes is expected to increase, but also the number of patients with diabetes with co morbidity. This implies that the current single disease management approach is not applicable to a large part of the patients with diabetes in the future.

Co-morbidity among patients with diabetes is associated with considerable consequences for health care and related costs. Co-morbidity has been shown to intensify health care utilization and to increase medical care costs for patients with diabetes. However, most studies have been focused on one health care service, mainly hospital care, or limited their analyses to one additional co morbid disease.In addition previous studies on multidisciplinary health care utilization were based on self-reported questionnaires instead of health care registration data. We elaborated on these studies by taking into account a broad spectrum of co morbidities and focusing on multiple health care services by linking data of different health care registrations.

A better understanding of the effects of co morbidity on the type and volume of medical health care utilization is essential to gain insight into future health care demands of patients with diabetes.

**DIABETIC RETINOPATHY**

Diabetic Retinopathy (DR) is a vascular disorder affecting the microvasculature of the retina. Diabetic Retinopathy is a complication of diabetes

and a leading cause of blindness. It occurs when diabetes damages the tiny blood vessels inside the retina, the light-sensitive tissue at the back of the eye. The patient having diabetic retinopathy might not notice any changes to the vision at first. But over time, diabetic retinopathy can get worse and cause vision loss. Diabetic retinopathy usually affects both eyes. It is estimated that diabetes mellitus affects 4 per cent of the world's population, almost half of whom have some degree of DR at any given time. DR occurs both in type 1 and type 2 diabetes mellitus and has been shown that nearly all type 1 and 75 per cent of type 2diabetes will develop DR after 15 yrs duration of diabetes as shown in earlier epidemiologicalstudies2, 3. In the western population, DR has shown to be the cause of visual impairment in 86 percent of type 1 diabetic patients and in 33 per cent of type 2 diabetic patients In India with the epidemic increase in type 2 diabetes mellitus as reported by the World Health Organization (WHO), diabetic retinopathy has been becoming a very important cause of visual disability and other visual problems. Visual disability from diabetes is a big public health problem. this morbidity is largely preventable and curable. The quality of life can be preserved if managed with timely intervention. This review aims at providing an overview of diabetic retinopathy in the Indian scenario.

**DIABETIC NEUROPATHY**

Diabetic neuropathies are a group of nerve disorders that may be caused by DM. nerve damage throughout the body may be observed in dm patients over time and this is a critical condition. In some cases for some people nerve damage may occur without any symptoms while for some others the damage may be followed with symptoms such as tingling, pain, or numbness loss of feeling in the hands,

arms, feet, and legs. These nerve damage or disorders may affect every organs in the body, including important organs like the heart, digestive tract, and sex organs. Neuropathy is observed in about 60 to 70 % of DM patients, People with diabetes can develop nerve problems at any time without any prediction, but risk rises with neuropathy are seen in people who have had diabetes for at least 25 years. In people who have problems in controlling their blood glucose, also called blood sugar, those with high levels of blood fat and high BP and those who are overweight, diabetic neuropathies appear to be more common and chronic. The no of nerves affected or the type of nerve affected may make changes in the symptoms also. Some people with nerve damage may have no symptoms at all while for others, symptom like the numbness, tingling, or pain in the feet can be observed. Symptoms can usually be minor at first, and because most nerve damage occurs over several years, mild cases may go unnoticed for a long time. Symptoms can involve the sensory, motor, and autonomic or involuntary nervous systems. In some people, mainly those with focal neuropathy, the onset of pain may be sudden and severe.

**SYMPTOMS OF NERVE DISEASES**

- The muscles of the feet or hands get wasted.
- Tendency for nausea, or vomiting and Indigestion.
- Diarrhea and constipation.
- faintness due to a drop in BP if sitting or standing up.
- Numbness, tingling, or pain in the toes, feet, legs, hands.
- Problems while urination.

- Erectile dysfunction may be seen in men or vaginal dryness can be observed in women.

**DIABETIC NEPHROPATHY**

Diabetic Nephropathy is the leading cause of kidney disease in patients starting renal replacement therapy and affects 40% of type 1 and type 2 diabetic patients. It increases the risk of death, mainly from cardiovascular causes, and is defined by increased urinary albumin excretion (UAE) in the absence of other renal diseases. Diabetic nephropathy is categorized into stages: micro albuminuria (UAE 20 g/min and 199 g/min) and macro albuminuria (UAE 200g/min).Hyperglycemia, increased blood pressure levels, and genetic predisposition are the main risk factors for the development of diabetic nephropathy. Elevated serum lipids, smoking habits, and the amount and origin of dietary protein also seem to play a role as risk factors. Screening for micro albuminuria should be performed yearly, starting 5 years after diagnosis in type 1 diabetes or earlier in the presence of puberty or poor metabolic control in patients with type 2 diabetes; screening should be performed at diagnosis and yearly thereafter. Patients with micro- and macro albuminuria should undergo an evaluation regarding the presence of co morbid associations, especially retinopathy and macro vascular disease. (100 mg/dl) are effective strategies for preventing the development of micro albuminuria, in delaying the progression to more advanced stages of nephropathy and in reducing cardiovascular mortality in patients with type 1 and type 2 diabetes.

**HYPERTENSION**

The prevalence of hypertension in the general population is about 20 to 30% andmorewithincreasingage and incertain ethnic groups. Isolated diastolic or systolic -diastolic hypertension is more common in younger people (<40 years) whereas systolic hypertension is more frequent in the elderly in olderpeople. The major cause of rising systolic and pulse pressurewith age is an increase in large artery stiffness. Associated factorsinclude obesity and reduced physical activity.

Hypertension is more prevalent in patients with diabetes than in the non-diabetic population, and early identification and effective management of hypertension is paramount in the care of people with diabetes. Adults with both diabetes and hypertension have more renal disease and atherogenic risk factors than the general population, including dyslipidemia, elevated fibrinogen and left ventricular hypertrophy. Having both diabetes and hypertension has been shown to double the risk of cardiovascular events, cardiovascular mortality and total mortality.

**HYPERLIPIDEMIA**

Hypercholesterolemia is a disorder characterized by high levels of blood cholesterol. Cholesterol is manufactured primarily in the liver and then carried to the cells throughout the body by low-density lipoprotein (LDL). Because cholesterol and other fats do not dissolve in water, they cannot travel through the body unaided. Lipoproteins are particles formed in the liver to transport cholesterol and other fats through the bloodstream. Cholesterol is returned to the liver from other body cells by another lipoprotein, high-density lipoprotein (HDL). From there, cholesterol is secreted into the bile, either unchanged or after conversion to bile acids.

Cardio vascular diseases are the leading cause death in many countries in the world. Coronary heart disease is the most common single case of death in the United States. Hypercholesterolemia (HC) is a well-established major risk factor for coronary heart disease. The increased risk of coronary artery disease subject with diabetes mellitus can be partially explained by the lipoprotein abnormalities with diabetes mellitus.

**PRECAUTIONS TO BE TAKEN BY DIABETIC PATIENTTS**

- With an interval of three months the dm patients should see their health care provider and should take proper diagnostic care.
- Always check the bones and skin of the feet and leg.
- Observe whether the patients feet are becoming numb and insensitive.
- Ophthalmoscope can be used to observe the back part of the eyes; it is a special lighted device.
- Blood pressure should be checked at least one in a year (blood pressure should be always at a normal rate 120/80 mm/hg.
- Hemoglobin A1C test (HbA1c) should be conducted every 6 months even if the diabetes is well controlled and cured; or every 3 months.
- cholesterol level and triglyceride levels should be checked yearly
- Kidney function test should be conducted yearly to check whether they are working properly. (microalbuminuria , serum creatinine level, etc.).
- Consult your eye doctor yearly or often , if the patient is diabetic.

- Consult the dentist every 6 months for a thorough dental cleaning and check up. The dentist and hygienist should know about the patient diabetes and diabetes history.

- The goal of treatment at first is to lower high blood glucose levels. The long-term goals of treatment are to prevent problems from diabetes.

The main treatment for type 2 diabetes is exercise and diet.

**MEDICATION TO REDUCE THE BLOOD GLUCOSE LEVEL**

**METFORMIN**

Metformin is a biguanide medicine. Its main function is to lower the blood glucose level in the body mainly by lowering the amount of sugar that the liver releases into the bloodstream. The sensitivity of the body to produce more insulin is also increased along with the increase of the action of the produced insulin on the glucose molecules. It has also been shown in studies that Metformin lower the risk of other complications of diabetes mellitus such as heart attack ,high BP , weakness, stroke, etc.

The first drug advised if blood glucose level is not controlled by lifestyle measures by the physician is metformin alone. If the patient is overweight, as it is less likely than some other glucose-lowering tablets to cause weight gain metaformin would be the advised drug. Metformin generally does not produce the problem of hypoglycemia like some of the other glucose level reducing drugs, this is a good advantage that the medicine has over the other drugs. Metformin can also be consumed along with other glucose lowering drugs, it does not produce much

adverse reactions and problems which can be considered as an advantage of the drug.

ADVERSE REACTIONS OF METFORMIN

Some people feel sick or have mild diarrhea When metformin is first started to be administered,. if they start with a low or mild dose and then gradually build up the dosage to the usual level over a few weeks then those problems which may be caused can be avoided . If side-effects occur, they tend to ease off with time. Other side-effects are not so common and usually does not produce much problems.

**SULFONYLUREA MEDICINES USED FOR DM**

There are many types of sulfonylurea medicines also which can be used for DM. some of these can be categorized as glimepiride, gliclazide, and glipizide. The main action these drugs produce on the body to lower dm is by increasing the insulin produced by the pancreas, they act on the pancreas to secrete more insulin as the body demand increases during DM .If the patient have type 2 diabetes mellitus , and still make insulin in the pancreas. It does not make enough to keep blood glucose level normal and keep it constant.

A sulfonylurea is most often used if the patient cannot take metformin because of side-effects or other reasons like allergy or such problems, or if the patient are not overweight. Usually the starting dose is very low, and the dose can be increased necessarily every few weeks until there the blood glucose level are under control . sulfonylurea can be consumed along with other glucose lowering drugs if they are not properly affecting in the body to keep blood glucose under normal level.

ADVERSE REACTIONS OF SULPHONYLUREA

As sulfonylurea's boost the level of insulin in the body, hypoglycemia is a possible problem that can be produced. This is an uncommon problem and unlikely to happen if they:, don't miss meals, and don't drink too much alcohol , have regular meals. Trembling , sweating, anxiety, blurred vision, tingling lips, paleness, mood change, vagueness or confusion, etc includes the symptoms of hypoglycemia. Sugary drink or some sweets can be taken to treat hypoglycemia.

Some weight gain is a very common side-effect that may be caused. Other side-effects are uncommon and rare. Feeling sick (nausea), mild diarrhea and constipation, etc can be the other side-effects caused.

**THIAZOLIDINEDIONES**

They are commonly called glitazones, thiazolidinedione's, they works by increasing the sensitivity of body's cells to insulin so that more glucose is taken into cells for the same amount of insulin in the bloodstream and thus reduce the blood glucose level of the body. They are not usually used alone, they are commonly administered along with metformin or sulfonylurea's

**ADVERSE REACTION OF THIAZOLIDINEDIONES**

Patients with heart failure, should not be administered with this drug as this may worse the condition. There is also a slight risk of liver damage also prevails over the use of this drug. Therefore, they should be a blood test to check on the liver function before starting these type of drugs. The tests should be repeated or done regularly to determine the normal rate of heart and kidney functions as long as these drugs are consumed. Weight gain is a side-effect common seen, probably due to

fluid retention in the cells. Hypoglycemia is an uncommon and rare side-effect. Other possible side-effects are uncommon and very rare.

**ACARBOSE**

Acarbose works by delaying the absorption of carbohydrates (which are broken down into glucose) from the gut. Therefore, it can reduce the peaks of blood glucose which may occur after meals. It is an option if they are unable to use other tablets to keep the blood glucose level down. It can also be used in addition to other glucose-lowering tablets. However, many people develop gut-related side-effects when taking acarbose, such as bloating, wind, and diarrhea. Therefore, it is not used very often.

**INSULIN**

Insulin injections decrease the blood glucose level. some people with type 2 diabetes need insulin. It may be advised if the blood glucose level is not well controlled by tablets. The dose and type of insulin used varies from person to person. Sometimes insulin is used alone. However, sometimes it is used in addition to along with the tablets. The doctor or practice nurse should give detailed advice on how and when to use it. Some weight gain is a common side-effect. Weight gain may be less of a problem if the use of insulin in combination with a glucose-lowering tablet such as metformin. Hypoglycemia is a possible complication.

**EXENATIDE AND LIRAGLUTIDE-GLUCAGON-LIKE PEPTIDE-1 MIMETICS**

Exenatide and liraglutide are treatments given as an injection. They work in a similar way to the action of the naturally occurring hormone glucagon-like peptide-1

(GLP-1). These actions include stimulating insulin secretion in response to glucose and preventing glucagon (a hormone which raises blood sugar) release after meals.

Exenatide and liraglutide are usually used as an add-on treatment to improve glucose control when insulin treatment is not acceptable. There is a once weekly treatment available. Side-effects may include hypoglycaemia, feeling sick and headaches. People receiving this treatment usually lose weight.

**PHARMACIST'S ROLE IN MANAGEMENT OF DIABETES**

Two large prospective intervention studies include the Diabetes Care and Complications Trial in type one diabetes and the UK Prospective Diabetes Study in type two diabetes. These studies demonstrated that intensive diabetes management resulted in lower rates of micro vascular complications. The Epidemiology of Diabetes Interventions and Complications trial, a follow up of the DCCT, has shown that initial intensive management has resulted in lower rates of retinopathy, nephropathy, neuropathy, and macro vascular disease. Pharmacists are an integral part of the health care delivery system in the America and are the most accessible health care peoples in most communities. The Pharmacists may help bridge the education gap, since it is has been reported that only 30% of patients receive formal diabetes education. The Pharmacists are uniquely positioned to provide diabetes education since patients with diabetes see their pharmacists seven times more often than they see their primary care physician. There are currently over 230,000 pharmacists in the America.

Almost all medically managed patients with Diabetes interact on an ongoing basis with a pharmacist. As such, pharmacists may have a profound influence on

improving the lives of the patients with diabetes whom they see in their daily practice. The role of the pharmacist in DSMT is well established. Common practice sites where DSMT is provided include community pharmacies, ambulatory care settings, hospitals, long-term care facilities, rehabilitation facilities, and physician offices. Other sites may include, but are not limited to, the Public Health Service (e.g., Indian Health Service) clinics, Community Health Centers, and private consulting practices. Numerous studies have shown that pharmacist interventions improve medication adherence, treatment outcomes, and quality of life for patients with diabetes. Studies have also shown that pharmacists have demonstrated cost savings by providing diabetes care in community settings as well as in Veterans Health Administration Clinics Pharmacists have even build up d a business model to provide pharmacy services.

The pharmacists are able to build strong relationships with patients and become a reliable source of information. Pharmacists may also have ongoing communication with physicians and may serve as the 'bridge' between other health care providers and the patient, thus ensuring continuity of care. In addition, pharmacists may provide on-going recommendations to the patients and their providers to optimize diabetes care.

These factors position Pharmacists to profoundly impact the health outcomes and quality of life for their patients with diabetes. A variety of pharmacist interventions to improve diabetes outcomes have been reported by pharmacists in community pharmacies. These interventions included diabetes education and pharmacologic management to improve glycemic control as well as lowering blood pressure and cholesterol. These programs were done in collaboration with

physicians, local formal diabetes education programs, and the patient's insurer. Pharmacist intervention was provided in concert with regular physician follow-up visits and formal diabetes education programs offered by local diabetes education Centers. Over 50% of patients had an improvement in A1C values relative to baseline. Average LDL- and HDL cholesterol levels improved at every visit. Patients were either referred by their primary care providers or could self-refer for a pharmacist consultation to evaluate A1C and lipid results, blood pressure, and receive diabetes education.

The Pharmacists provided three one-hour sessions and quarterly follow-up visits to assess patient progress toward goals. After each visit, the pharmacist sent a report of the patient's lab and blood pressure with Recommendations for drug therapy changes to the patient's physician. The Scope of Practice for pharmacist diabetes educators defines a range of practice for the specialty, and provides a framework for appropriate and effective pharmacist practice in diabetes care. All pharmacists must be knowledgeable of the disease state and coexisting diseases, to provide safe, competent care to persons with, or at risk, for diabetes. As the intensity of care increases, so must a pharmacist's knowledge base increase through experience, continuing education, individual study, mentorship, and potentially, certification.Pharmacists providing diabetes care utilize established principles of education strategies, learning theory, and provide lifestyle counseling to help patients effectively manage their disease. Instruction is individualized for persons of all ages, incorporating cultural preferences, health beliefs, and preferred learning styles of the patient.

# LITERATURE REVIEW

***Jaansidorov,Roberts hull et al (2002)***observed whether Diabetes Disease Management Save Money and Improve Outcomes Little are known about the impact of disease management programs on medical costs for patients with diabetes. This study compared health care costs for patients who fulfilled health employer data and information set (HEDIS) criteria for diabetes and were in a health maintenance organization (HMO)-sponsored disease management program with costs for those not in disease management. We retrospectively examined paid healthcare claims and other measures of health care use over 2 years among 6,799 continuously enrolled Geisinger Health Plan patients who fulfilled HEDIS criteria for diabetes. Two groups were compared: those who were enrolled in an opt-in disease management program and those who were not enrolled. We also compared HEDIS data on HbA1c testing, percent not in control, lipid testing, diabetic eye screening, and kidney disease screening. All HEDIS measures were based on a hybrid method of claims and chart audits, except for percent not in control, which was based on chart audits only.

***Michele, eisler, M. Smith et al (2003***conducted a Patients' Assessments of Their Diabetes Self-Management Correlate With Actual Glycemic Control and Receipt of RecommendedDiabetes Services Although patient diabetes self-management is a key determinant of health outcomes, there is little evidence on whether patients own assessments of their self-management correlates with glycemic control and key aspects of high-quality diabetes care. 1We explored these associations in a nationwide sample of Veterans' Affairs patients with diabetes We abstracted information on achieved levelof glycemic control (HbA1c) and diabetes processes of

care (receipt of HbA1ctest, eye examination, and nephropathy screen) from medical records of 1,032 diabetic patients who received carefrom 21 Veterans' Affairs facilities and had answered the Diabetes Quality Improvement Program survey in2000. The survey included sociodemographic measures and a five-item scale assessing thepatients' diabetes self-management (medication use, blood glucose monitoring, diet, exercise, and foot care [0.68]). Using multivariable regression, we examined the associations ofpatients' reported self-management with HbA1clevel and receipt of each diabetes process of care.We adjusted for diabetes severity and co-morbidities, insulin use, age, ethnicity, income, education, use of VA services, and clustering at the facility level.

***McGowan et al (2011)***studied theefficacy of diabetes Patient Education and Self - Management Education in Type 2 DM the goal of this randomized, controlled trial was to compare the 6-month efficacy of didactic diabetes patient education to a model that augmented this education with a self-management program. Adults with type II diabetes wererandomly assigned to a group that received diabetes patient education or to a group that received this education augmented by a community self-management program. Outcome measures were taken at baseline and six months. Analysis included pre-and 6 month-post–program paired comparison for each group; a comparison of change between groups; and an intent-to-treat comparison of change between the groups. At baseline, there were no between-condition differences with respect to behavioral or biological outcomes or healthcare utilization. The pre- and 6-month-post–program comparison found statistically significant improvements in both groups in terms of glycated hemoglobin (A1C) and weight, and the experimental group had statistically significant improvements in

4 additional outcomes. A 12-month analysis found that baseline scores were statistically forbothA1Candweightintheexperimentalgroup statistically higher than baseline A1C in the control group.

***Rhonda M, Wendy et al (2005)*** studied about the Effect of a pharmaceutical patient education program on Vascular Risk Factors in Type 2Diabetes examine the effect of a 12-month PCprogram on vascular risk in type 2 diabetes. We recruited 198 community-based patients randomized to pharmaceutical care or usual care. Pharmaceutical care patients had face-to-face goal-directed medication and lifestyle counseling at baseline and at 6 and 12 months plus 6-weekly telephone assessments and provision of other educational material. The main outcome measure was change in HbA1cA diabetes-specific risk engine was used to estimate changes in 10-year CHD and stroke risk in patients without a history of cardiovascular disease. At total of 180 patients (91%) completed the study. Mean (95% CI) reductions were greater in PC case subjects (n 92) than control subjects (n 88) for hemoglobinbA1c and systolic 14 mmHg [19 to9] vs.7 [11 to2] and diastolic 5 mmHg blood pressure (P 0.043). The improvement in hemoglobinA1c persisted after adjustment for baseline value and demographic and treatment specific variables. The median 10-year estimated risk of a first chronic heart disease event decreased in the PC case subjects but not in the control subject. A 12-month PC program in type 2 diabetes reduced glycemia and blood pressure. Pharmacist involvement contributed to improvement in HbA1cindependently of pharmacotherapeutic changes.

***Martham, F Unnel, Tammy L et al (2009)*** conducted a Diabetes self-management education (DSME) is a critical element of care for all people with diabetes and is necessary in order to improve patient out-comes. The National

Standards for DSME are designed to define quality diabetes self-management education and to assist diabetes educators in a variety of settings to provide evidence-based education. Be-cause of the dynamic nature of health care and diabetes-related research, these Standards are reviewed and revised approximately every 5 years by key organizations and federal agencies within the diabetes education community. A Task Force was jointly convened by the American Association of Diabetes Educators and the American Diabetes Association in the summer of 2006. Additional organizations that were represented included the American Dietetic Association, the Veteran's Health Administration, the Centers for Disease Control and Prevention, the Indian Health Service, and the American Pharmaceutical Association. Members of the Task Force included a person with diabetes; several health services researchers/behaviorists, registered nurses, and registered dietitians; and a pharmacist. The Task Force was charged with re-viewing the current DSME standards for their appropriateness, relevance, and scientific basis. The Standards were then re-viewed and revised based on the available evidence and expert consensus. The committee convened on 31 March 2006 and September 2006, and the Standards were approved 25 March 2007.Diabetes self-management education (DSME) is the ongoing process of facilitating the knowledge, skill, and ability necessary for diabetes self-care. This process incorporates the needs, goals, and life experiences of the person with diabetes and is guided by evidence-based standards. The overall objectives of DSME are to support informed decision-making, self-care behaviors, problem solving and active collaboration with the health care team and to improve clinical outcomes, health status, and quality of life.

***Kelly R. Ragucci. Fermo et al (2005)*** evaluated the effectiveness of pharmacist-administered diabetes mellitus education and management services on selected diabetes performance measures. Additional goals were to compare outcomes with goals specified for patients with diabetes by the National Committee for Quality Assurance (NCQA) and identify areas for improvement each patient was assessed for hemoglobin $A_{1c}$ (A1C) values, blood pressure, low-density lipoprotein cholesterol (LDL) levels, and aspirin use at baseline and at 1 year after enrollment. Cost avoidance comparators were calculated for those patients with reductions in A1C of at least 1%. Average A1C at 1 year was 7.8% (range 4.5-13.9%) versus 9.5% (range 5.4-19%) at baseline (change -1.7%, $p<0.05$). Seventy-two patients (38%) experienced a 1% or greater reduction in A1C. Average blood pressure decreased over the study period from 141/79 to 135/75 mm Hg ($p=0.007$), but average LDL levels did not change to a statistically significant extent (114 to 112 mg/dl, $p>0.05$). Aspirin use increased from 34% at baseline to 73% at 1 year ($p<0.0001$). The program achieved the A1C and LDL values required to qualify for NCQA diabetes recognition. Based on an estimated savings for each 1% decrease in A1C.Diabetes management services from clinical pharmacists achieved significant improvements in A1C values, blood pressure, and aspirin use. Continued efforts in diabetes education and management are needed to further improve clinical, economic, and humanistic outcomes. Approximately 6.3% of the United States population has diabetes mellitus, which ranks as the sixth leading cause of death and generates annual costs above million. Numerous guidelines specify optimal care for patients with diabetes, but a gap exists between these recommendations and the actual care administered. [2]According to the American Diabetes Association (ADA), the target for long-term glycemic control in patients with diabetes is hemoglobin $A_{1c}$ (A1C)

below 7%. [3] Patients with diabetes are at increased risk of cardiovascular events; thus, additional treatment goals include achieving blood pressure below 130/80 mm Hg, low-density lipoprotein cholesterol (LDL) levels below 100 mg/dl (or < 70 mg/dl for those at particularly high risk), and daily aspirin therapy.

***, Ali Mohammad Sabzghabaee ShadiFarsaei et al (2010 )*** *The* study was conducted to evaluate the effect of a clinical pharmacists patient education program for type 2 diabetic patients at Isfahan Endocrine & Metabolism Research Center from 04/2008 to 01/2009. This randomized controlled clinical trial, the total of 172 patients with uncontrolled type 2 diabetes were selected and randomly allocated into control and study groups. After that written consent, the intervention group received an educational program about oral anti-hyperglycemic medications, adherence, diabetes dairy log and pill box usage. Patient's glycemic control in the intervention group was followed for three months through either telephone or face to face interviews with the pharmacist. Fasting blood glucose and HbA1c were measured at the start and end of the pharmacists drug education program for both intervention and control groups. After a three months follow-up, mean fasting blood glucose and HbA1c of the patients in the intervention group decreased significantly compared to control group ($p < 0.001$). This study demonstrates an improvement in diabetes management of type 2 diabetics by involving a pharmacist in the multidisciplinary teams in the outpatient clinics. The results suggest the benefits of adding adherence education to the diabetic education programs.

***Rhonda M.Clifford,Wendy A. Davis et al (2005)***examined the effect of a 12-month pharmaceutical care program on vascular risk in type 2 diabetes. We recruited 198 community-based patients randomized to PC or usual care. PC patients had

face-to-face goal-directed medication and lifestyle counseling at baseline and at 6 and 12 months plus 6-weekly telephone assessments and provision of other educational material. Clinical, biochemical, and medication-related data were sent regularly to each patient's physician(s). The main outcome measure was change in $HbA_{1c}$. A diabetes-specific risk engine was used to estimate changes in 10-year coronary heart disease and stroke risk in patients without a history of cardiovascular disease. A 12-month PC program in type 2 diabetes reduced glycemia and blood pressure.Pharmacistinvolvementcontributedtoimprovementin$HbA_{1c}$independentlyof pharmacotherapeutic changes. PC could prove a valuable component of community-based multidisciplinary diabetes care.

***Priscilla A Hollander et al (2010)*** proposed a clinical focused study of type 2 diabetes co-morbidities and treatment challenges. The management of type 2 diabetes is designed to reduce disease related complications and enhance long-term outcomes. Achieving glycemic control is a critical component of this process. The selection of a drug therapy for minimizing blood glucose is made more challenging when patients already have complications or co morbid conditions.Dispeptidylpeptidase-4(DPP-4) inhibitors are new classes of anti-hyperglycemic drugs that blocks degradation of incest in hormones. Conclusion of the study is in such a way that many patients with diabetes have disease related complications or co morbid conditions, which can hinder disease management. In choosing anti hyperglycemic medications, efficacy for improving glycemic control must be balanced against safety and tolerability issues that can adversely affect these complications and co-morbidities. DPP-4 inhibitors provide a favorable balance between efficacy and safety/tolerability. They offer efficacy similar to other oral anti

hyperglycemic drugs, but offer tolerability advantages to some agents, including low risk of hypoglycemia and GI adversities, and weight-neutral effects.

***AmitRaval et al (2009)***reported study prevalence and determinants of depression in type 2 diabetes patients in a territory care center. Objective of the study is to investigate the prevalence and determinants of depression in patients with established type 2 diabetes (T2DM) attending a tertiary care hospital in north India. Patients with established T2DM were evaluated for depression by administering the nine-item PHQ-9 (Hindi version). Binary logistic regression model was used to examine association between predictor variables and risk of depression. Cronbach alpha was calculated to assess internal consistency of PHQ-9. The outcome of this study is that out of the study patients, 68 (23%) met the criteria for major depression, 54 (18%) for moderate depression and the remaining 178(59%) had no clinically significant depression. Depression was strongly associated with age >54 yr. (OR) 1.26, 95% CI 1.02-1.67; P,0.05), central obesity (OR 1.34, 95% CI 1.04-1.64; P,,0.001), neuropathy (OR 1.94, 95% CI 1.03-3.66; P= 0.002) nephropathy (OR 1.81, 95% CI 1.02-3.21; P = 0.041), peripheral vascular disease (OR 6.08, 95% CI 1.07-34.6; P= 0.042), diabetic foot disease (OR 2.32, 95% CI 1.06-5.86; P,0.001) and pill burden (.4) (OR 1.27, 95% CI 1.01-1.44; P=0.035). However, the likelihood of depression was not significant with duration of diabetes and insulin use. To conclude this study showed high prevalence of depression in patients with T2DM. The risk factors for depression were age, central obesity, diabetic complications particularly neuropathy and diabetic foot disease and increased pill burden.

***Hwee-Lin et al (2005)*** reported a cross-sectional study in the impact of Diabetes mellitus and other chronic medical conditions on the health related quality

of life. The result of this study is that among 5224 subjects, the prevalence of DM, HTN, HD and MS where 5.9%, 10.7%, 2.4%, 26.6% respectively. DM lowered SF-36 scores by more than 2 points on 3 SF -36 scales and lowered SF-6D scores 0.03 points. Subjects with DM and HTN, DM and HD or DM and MS experienced further lowering SF-36 scores exceeding 2 points on at least 6 scales and further lowering of SF-6D scores by 0.05,0.08 and 0.10 point respectively. SF-6D index scores generally reflected the pattern of influence of DM and chronic medical conditions on SF-36 scores. This study conducted that DM and chronic medical conditions generally reduced HRQoL in this multiethnic general population in an additive, rather than synergistic or subtractive fashion.

***AsliTalazAkca et al (2004)*** reported a cross sectional sample survey type study of comparison of psychological adjustment in people with diabetes with and without diabetic foot ulceration. Objective of the study is to determine whether psychological adjustment to illness differs in people with diabetes between those who have or do not have diabetic foot ulceration. Two hundred participants with a diagnosis, according to World Health Organization criteria, of type 1 or type 2 diabetes for at least one year were enrolled in the study. 100 participants receiving hyperbaric oxygen therapy had diabetic foot ulceration DF and 100 participants had diabetes without DFU Result of the study is advanced age, low education levels, long diabetes duration, poor metabolic control and not exercising may be risk factors for DFU. Participants without DFU had fewer problems in the domainof healthcare orientation, vocational environment, sexual relationships, social environment and Psychological distress than participants with DFU. In participants with DFU; poorer psychological adjustment was associated with poorer metabolic control, lower

education status, not exercising and retirement. In participants without DFU, women had better psychological adjustment than men. Also, participants exercising had better psychological adjustment than participants not exercising.

***TatjanaMiclenkovie et al (2004)*** reported a cross sectional study of influence of diabetic education on patients wellbeing and metabolic control. The aim of this study was to evaluate possible influence of a structured teaching program for interactive group education of diabetic patients on their overall wellbeing and metabolic control. The study included 110 insulin treated diabetic patients. They were followed for one year after a 4-day structured teaching program. At re-education sessions one year after education we noted significant improvement in metabolic control. HbAlc decreased from 9.2+-1.3 to 7.7+-1.8% Diabetes related knowledge increased from 49.1+_16.8 to 85.4+-14.3% and patient overall wellbeing improved from 46.8+-8.3 to 54.8+-5.9 due to reduction of depression and anxiety and increase in energy and wellbeing. Study result confirmed improvement of overall wellbeing, metabolic control and diabetes related knowledge in insulin treated diabetes patients after a structured education program.

# AIM AND OBJECTIVES

**AIM:**

To study the prevalence of co-morbidities in type2 diabetes mellitus patients, the awareness level and the impact of pharmacist's patient education program.

**OBJECTIVES:**

- To study the prevalence of co morbidity in type 2 diabetespatients.
- Understand the awareness of the patients about the co morbidities of diabetes.
- Implement a patient education program on co morbidities in type 2 diabetes mellitus patients.
- Understand the impact of patient education program on the awareness levels of the patients.
- Find out the clinical outcome if any of the Patient education program.

# PLAN OF WORK

The present dissertation work was planned in 4 phases.

**PHASE I:**

- Initial study to identify the scope of work
- Literature Survey
- Preparation of study protocol

**PHASE II:**

- IEC clearance
- Gaining consent from the hospital
- Design data collection and educational formats with reference to communication, prevalence of co-morbidity, patient education program
- Get consent from the patients
- Data collection

**PHASE III:**

- Implement the pharmacist's patient education program
- Data collection

**PHASE IV:**

- Analysis of data

# METHODOLOGY

This chapter comprises of study site, study population, study design, data collection and data analysis.

## STUDY SITE

Study was carried out in the inpatient and outpatient department of **C.S.I Mission Hospital** located at Malappuram district Kerala having 100 beds and specialized in other, general, medicine, pediatric, dermatology and gynecology and a 24 hour working casualty.

Data were collected from in patient &out patient files of general medicine department in that hospital and by interviewing the patients.

## STUDY DESIGN

A prospective study with questionnaire used to evaluate type 2 diabetes with co-morbiditiesand awareness levels.

## STUDY PERIOD

The study was carried out from May 2013 to February 2014 (10 months)

## STUDY POPULATION

The study population consists of 699 diabetic patients those who qualified the inclusion criteria.

# STUDY CRITERIA

## INCLUSION CRITERIA

- Patients with type 2 diabetes mellitus was included in the study
- Both male and female included in the study
- Patients with existing co-morbidities

## EXCLUSION CRITERIA

- Pediatric patient were excluded
- Emergency care patient excluded
- Pregnant women are excluded
- Mentally retarded patient excluded
- Type 1 diabetes mellitus was excluded
- Patient who have not been able to attend at least 3 visits to the hospital during the study period.

## DATA COLLECTION

Permission was obtained from hospital administration and doctors to conduct the study in that Hospital .The study was carried using medical chart of 699 randomly selected patients who had been treated in the hospital and data was collected from prescription, current medication chart and laboratory records. Informed consent was obtained from the patients before the interview.

## STUDY PROCEDURES

Research type was descriptive observational study. The data were collected from 699 cares of patientin first visit, second visit and third visit. In the first visit patient will sign informed patent consent form and asking questionnaire.The variables analyzed were general characteristics of the patient genders, Age, current, medical history and medicine prescribed during hospital hospitalization. The

medication uses of patients during hospitalization were recorded. Also giving education and counseling to the patients regarding dietary changes,exercise, and importance of medication adherence etc. in first and second visit. The data collection of impact of pharmacist education program questionnaire is continuing in the final visit during this study.

**Level-1**

Based on the prescription of the diagnosis co-morbidities were identified.

**Level -2**

Interviewto understand the awareness level of the patient on the co-morbidities.

**Level -3**

Patient awareness program on co-morbidities was initiated

**Level- 4**

Follow up on same parameter to understand the impact of patient awareness program on the patient,the awareness level before and after pharmacist's patient education programwas compared and the impact of pharmacist patient's education program diabetes was co morbidities.

**STATISTICAL TOOL**

The information collected regarding all the selected cases were recorded in a Master Chart. Data analysis was done with the help of computer using **SPSS**ver:17 2010

Using this software range, frequencies, percentages, means, standard deviations, chi square and'p' values were calculated. Kruskul Wallis **chi-square test** was used to test the significance of difference between quantitative variables and Yate's chi square test for qualitative variables. A **'p**' value less than 0.05 is taken to denote significant relationship.

Qualitative responses were obtained for the 6 questions from the Study cases. In order to make a quantitative analysis, scores were given to the qualitative responses as follows.

# RESULTS AND DISCUSSION

The study attended to estimate the quality of life in patient suffering from DM with co morbidities using question air. The improvements of the quality of life in DM patient with co morbidities are also analyzed in this study and the roll of pharmacist in patient education program is also determined during the study. The impact of study and patient education program on those patients were also studied in detailed.

Diabetes mellitus is one of the most common non communicable diseasesglobally. DM can be further divide in to two types, Type I and Type II diabetes mellitus.The Type II DM is a chronic metabolic disorder which is characterized by insulin resistance, impaired functions of islets of beta cells and multiple other metabolic or endocrine abnormalities. It is estimated that the total number of people with DM is projected to raise from 171 million in 2000 to 366 million in 2030 and the prevalence is higher in men than in women. The disease can be dangerous and deadly if untreated at proper period and may also have other complication.

DM can be more dangerous and deadly when accompanied by other chronic disease called co-morbidities, these may include cardiovascular diseases, retinopathy, neuropathy, nephropathy,DFUand hypertension etc. which may increase the mortality rate and may also decrease the quality of life.

The high rate of increasing DM and co-morbidities signifies that patient education programs and decreasing this rate is the need for the hour, keeping the concept in mind a study program was conducted to determine the number of people

suffering from DM and co-morbidities and also steps were taken to educate the people about the seriousness of the disease.

The area which I preferred for my thesis regarding DM and its co-morbidities was Codacal which is located in Malappuram district in Kerala state. The area is highly populated fast developing area so most of the people are unaware about the dangerous disease diabetes mellitus and its co-morbidities. CSI Hospital Codacal was the institution where I performed the thesis. The patient who was diagnosed in the hospital was mainly used for the studies and the PEP. The changes in their life style and the extent of the disease before and after the education program were also studied carefully.

Most of the people living in and around Codacal are economically forward and well settled; most of them are carless about their health so conducting such an educational research program was very useful in making people aware about DM and its co-morbidity.

Consumption of alcohol and smoking has been reported as the main cause of cardiovascular diseases, Neuropathy, Retinopathy, hypertension etc. and these co-morbidities affect DM in an adverse manner, so smoking and alcohol consumption of DM patients can be dangerous and should be seen in a more serious manner.

The objective of the study was to determine the prevalence of co-morbidities in type 2 diabetes patients. The awareness level of the patients about the co-morbidities of diabetes was also studied and observed. The patient education program on co-morbidities in type 2 diabetes mellitus was also conducted and efforts were made to understand the impact of pharmacist's patient education

program on the awareness level of the patients. Clinical outcome of the study was also determined.

**DEMOGRAPHICAL DATA**

A total of about 1126 patients were randomly selected for this study, out of which about 862npeople were suffering from type 2 DM out of the 862 people 699 attended the further studies and patient education program. The rest were avoided due to lack of regular follow up, Final statistical analysis of the data was done for a total of 699 patients those who completed the study with regular follow up.

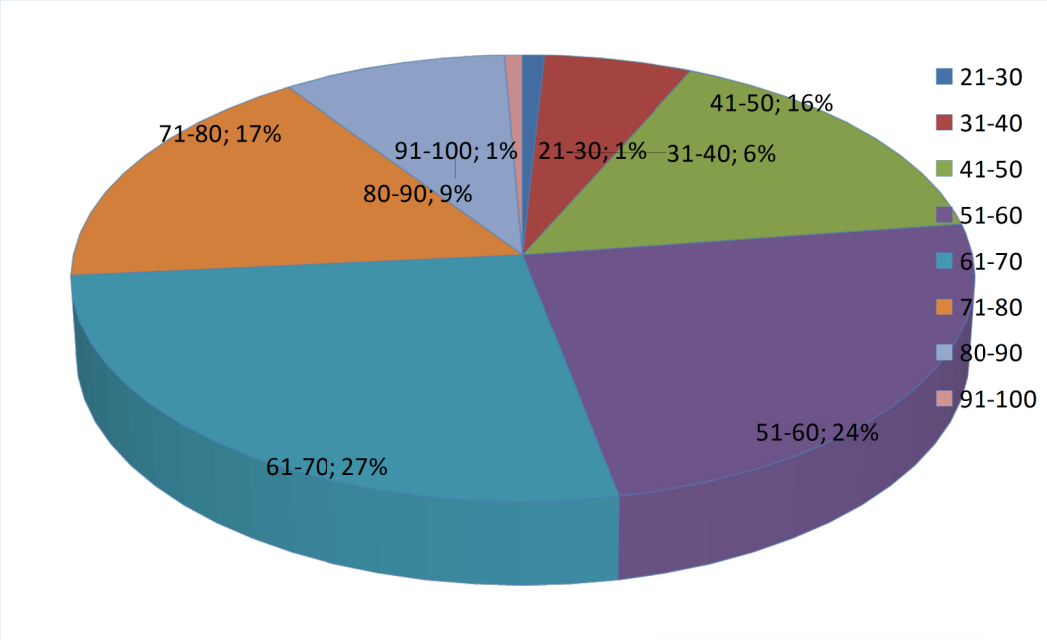
The table 1 shows the demographical data of the study conducted. It was noted that out of the 699 patients who were part of the study 374 were males and 325 were females. The chartclearly describes about the total number of people who attended the program from different age groups and the chart also gives a clear cut idea about the number of male and female patients who attended the program from different age groups and also says about the percentage of males and females from different age groups who suffers from diabetes mellitus.

**Table 1: Age and sex distribution**

| Age | N=699 | % To Total | Female | Female % | Male | Male% |
|---|---|---|---|---|---|---|
| 21-30 | 6 | 0.9 | 3 | 0.4 | 3 | 0.4 |
| 31-40 | 41 | 5.9 | 24 | 3.4 | 17 | 2.4 |
| 41-50 | 112 | 16.0 | 53 | 7.6 | 59 | 8.4 |
| 51-60 | 169 | 24.2 | 79 | 11.3 | 90 | 12.9 |
| 61-70 | 186 | 26.6 | 90 | 12.9 | 96 | 13.7 |
| 71-80 | 118 | 16.9 | 44 | 6.3 | 74 | 10.6 |
| 80-90 | 62 | 8.9 | 27 | 3.9 | 35 | 5.0 |
| 91-100 | 5 | 0.7 | 5 | 0.7 | 0 | 0 |
| | | | **325** | | **374** | |

According to the graphical picture, male patients were more affected to type 2 diabetes mellitus than female patents. The chart says that about 53.5% of patients who attended the studies were males and about 46.5% were females.

**Age distribution**




**Picture 1: Age distribution**

Six people from the age group of 21-30 attended the program out of which three were males and three were females so it proves that 0.4%males and females who suffered from type 2 diabetes mellitus is from this age group. In the age group of 31-40 forty one people participated in the program, 24 of them where females and 17 were males thus 3.4% of females from age group of 31-40 are affected by diabetes mellitus and 2.4% of male from this age group suffers from the disease. From the age group of 41-50, hundred and twelve people attended the studies, out of which 53 were females and 59 were males this means that 7.6% of females and 8.4% of males suffers from type 2 diabetes mellitus are from this age group .169

people who attended the program were from age group of 51-60 out of which 79 were females and 90 were males so 11.3% females and 12.9% of males are affected by the disease from this age group.

From the age group of 61-70 hundred and eighty six people were affected, 90 of them were female and 96 of them males, 12.9% of females and 13.7% of males are affected by type 2 diabetes mellitus from the age group of 61 -70. Forty four females and 74 males from the age group of 71-80 was present for this study, that is a total of 118 people from this age group attended this studies,6.3% females and 10.6% males affected to diabetes mellitus are from this age group. From the age group 80- 90, 62 people attended the program out of which 27 were females and 35 were males, 3.9% of females and 5.0% of males were affected diabetes mellitus are from this age group. Five females from the age group of 91-100 attended the program, 0.5% females affected to the disease is from this age group.

The table clearly describes that most number of people affected to type 2 diabetes mellitus is from the age group of 61-70 and the second largest age group with the disease is 51-60 and the table also says that males are more prone to DM than females.

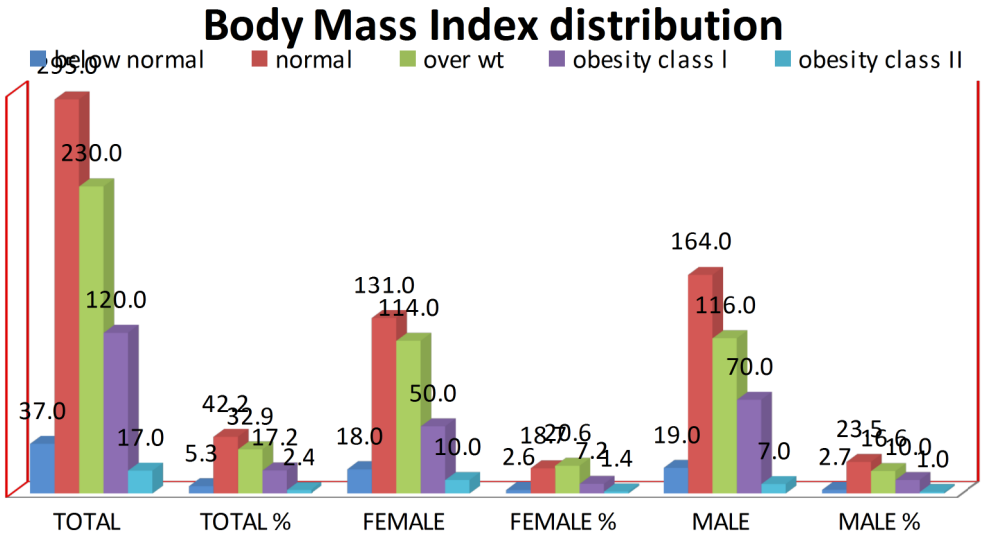
**BODY MASS INDEX (BMI)**

In table 2 an attempt is made to categories all the patients who took part in the studies on the basis of body mass index (BMI) for this, BMI range was divided in to five categories- below normal ,normal, over wait , obesity class I and obesity class II. Male and female data were separately classified below these categories.

**Table 2: BMI Distribution**

| Category | N=699 | % to Total | Female | % to Total (F) | Male | % to Total (M) |
|---|---|---|---|---|---|---|
| below normal | 37 | 5.3 | 18 | 2.6 | 19 | 2.7 |
| Normal | 295 | 42.2 | 131 | 18.7 | 164 | 23.5 |
| Over wt | 230 | 32.9 | 114 | 20.6 | 116 | 16.6 |
| Obesity class I | 120 | 17.2 | 50 | 7.2 | 70 | 10.0 |
| Obesity class II | 17 | 2.4 | 10 | 1.4 | 7 | 1.0 |
| | | | **325** | | **374** | |

A total of 37 people came under the category of below normal in which 18 were females and 19 males thus 2.6% of females and 2.7% of males who took part in the studies comes under this categories. Under the category of normal range 295 patients were added among them 131 where females and 164 were males that is 18.7% females and 23.5% males comes under the categories. The over wait category has 230 patients in which 114 are females and 116 are males, thus 20.6% of females and 16.6% of males are under this categories.




**Picture 2: Body Mass Index distribution**

The obesity class one (class I) and obesity class two (class II) had 120 and 17 patients respectively, in which 50 females and 70 males were present in obesity class I and 10 females and 7 males were present in obesity class II. 7.2% of female and the 10% of males comes under obesity class one and 1.4% of females and 1% males come under obesity class II

From the picture it was clear that most of the patients who took part in our studies were in the normal range and the overweight range of body mass index

**DIABETES CO-MORBIDITIES**

**Table 3: Diabetes Co-morbidities**

| Sl no | Co-morbidity | Total count | % To Total | Female | | Male | |
|---|---|---|---|---|---|---|---|
| | | | | No of patients | % To Total | No of patients | % To Total |
| 1 | Hypertension | 594 | 85.0 | 267 | 38.2 | 327 | 46.8 |
| 2 | Nephropathy | 291 | 41.6 | 175 | 25.0 | 116 | 16.6 |
| 3 | Neuropathy | 284 | 40.6 | 120 | 17.2 | 164 | 23.5 |
| 4 | Hyperlipidemia | 615 | 88.0 | 263 | 37.6 | 342 | 48.9 |
| 5 | Retinopathy | 118 | 16.9 | 52 | 7.4 | 66 | 9.4 |
| 6 | Vertigo | 163 | 23.3 | 87 | 12.4 | 76 | 10.9 |
| 7 | Allergic rhinitis | 128 | 18.3 | 57 | 8.2 | 71 | 10.2 |
| 8 | Calcium deficiency | 286 | 40.9 | 128 | 18.3 | 158 | 22.6 |
| 9 | Vit K deficiency | 91 | 13.0 | 43 | 6.2 | 48 | 6.9 |
| 10 | Respiratory disease | 158 | 22.6 | 76 | 10.9 | 82 | 11.7 |
| 11 | Gastritis | 64 | 9.2 | 33 | 4.7 | 31 | 4.4 |
| 12 | Antifungal drugs | 8 | 1.1 | 2 | 0.3 | 6 | 0.9 |
| 13 | Anemia | 112 | 16.0 | 44 | 6.3 | 68 | 9.7 |
| 14 | Gout | 122 | 17.5 | 60 | 8.6 | 62 | 8.9 |
| 15 | Mood stabilizer medicines | 173 | 24.7 | 88 | 12.6 | 85 | 12.2 |
| 16 | Parkinson’s disease | 87 | 12.4 | 37 | 5.3 | 50 | 7.2 |
| 17 | Pneumonia | 16 | 2.3 | 6 | 0.9 | 10 | 1.4 |
| 18 | Thyroid | 118 | 16.9 | 71 | 10.2 | 47 | 6.7 |

Table 3 says about different co-morbidities which were affected to those patients, who were considered for our studies. The table also gives an idea about the

total number of males and females who were affected to different co-morbidities. The percentage of patients under each co-morbidity is also given, with separate male and female percentages.

It is clear that hypertension is a common co-morbidity found in most of the diabetes mellitus patients Out of the 699 patients who were considered for the studies 594 were suffering from hypertension, that is about 85% of patients were suffering from hypertension 38.2% of females and 46.8% of males who took part in the studies were suffering from hypertension.

Hyperlipidemia was affected to 615 patients in which 263 were females and 342 were males. This indicates that 88% patients are affected to the disease and 37.6% females and 48.9% males had this co-morbidity. The next reported co-morbidity was retinopathy, 118(16.9%) patients suffered from the disease in which 52 were females and 66 were males.

Nephropathy is co-morbidity, 291 patients were affected to the disease in which 175 were females and 116 were males. So 41.6% DM patient suffers from the disease nephropathy. 25% of female and 16.6% male diabetes patients had the co-morbidity nephropathy.

Calcium deficiency and vitamin k deficiency was also reported in DM patients and their range was 286 and 91 respectively, that constitute a percentage of 40.9 suffering from calcium deficiency and 13% from vitamin k deficiency. 128 females (18.3%) and 158 males (22.6) suffered from calcium deficiency and 43 females (6.3%) and 48 males (6.9%) suffered from vitamin k deficiency.

284 patients had neuropathy that is a percentage of 40.6 patients had neuropathy, out of which 120 (17.2%) were females and 164(23.5%) were males. A problem of mood stabilization was also found in 173 patients, that indicate 24,7% people had this co-morbidity, which included 88 females(12.6%) and 85 males (12.2%).It was clear from the table that 163 patients (23.3%) suffered from vertigo which included 87 females and 76 males, thus 12.4% of females and 10.9% males were affected with this co-morbidity.

Respiratory problems were noted in 158 patients in whom 76 were females and 82 were males, which are out of the 26.6% of total affected patients 10.9% were females and 11.7% weremales. The table clearly indicates that 128 (18.3%) patients suffered from allergic problems, in which 57 were females (8.2%) and 71 were males (10.2%).

Thyroid diseases were found in 118 patients, 71 of them were females and 47 were males. The table also says that 16.9 % patients had thyroid problems and 10.2% of then were females and 6.7% were males. Gout was found in 122 patients, that is a total of 17.5%.the table also says that 60of them were females (8.6%) and 62 were males (8.9%).

Anemia, it can be a deadly and dangerous disease when accompanied with DM, other problems like vertigo and cardiovascular problems also may be seen along with anemia. According to the table the disease was found in 112 patients (16.0%), 44 of them were females and 68 were males, that is 6.3% were females and 9.7% of males were affected by the disease.

Parkinson's disease was found in 37 females and 50 males, a total of 87 patients suffered from the disease, when describing it according to percentage wise 12.4% of patients were affected to the disease in which 5.3% patients were females and 7.2 % were males.

The table shows that 64 (9.2%) patients suffered from gastritis out of which 33 were females(4.7) and 31 were males(4.4%) other non DM problems like medicine and some food may also be a reason for the disease.

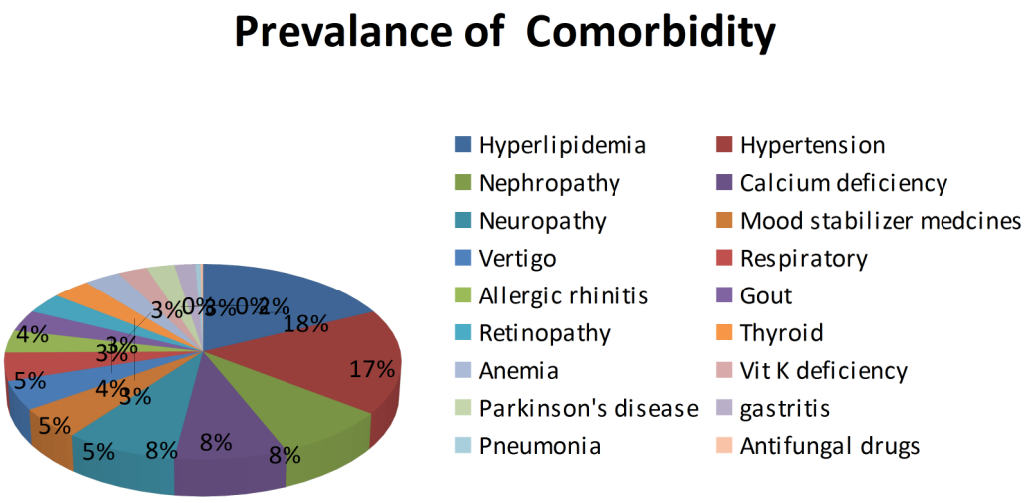
A total of 16 patients suffered from pneumonia which includes 6 females and 10 males, which are out of the total 2.3% of patients affected 0.9% were females and 1.4% were males.About 6males and 2 females that is a total of 8 patients had antifungal problems. That is only 1.1% had the problem, 0.3% of them were females and 0.9% were males.

The table clearly describes that hypertension and hyperlipidemia are the most common co-morbidities found in diabetes mellitus patients, more than 99% of patients are affected to hypertension and 95% are affected to hyperlipidemia

Table 4 describes about the co-morbidities present in the DM patients. The table clearly arranges the co-morbidities in descending orderof the people affected. The table gives information about the total number of people affected by each co-morbidity and also gives the percentage of affected patients and then arranges all these data in descending order.

**Table 4: Prevalence of Co-morbidity**

| Sl no | Co-morbidity | Total | % To |
|---|---|---|---|
| 1 | Hyperlipidemia | 615 | 88.0 |
| 2 | Hypertension | 594 | 85.0 |
| 3 | Nephropathy | 291 | 41.6 |
| 4 | Calcium deficiency | 286 | 40.9 |
| 5 | Neuropathy | 284 | 40.6 |
| 6 | Mood stabilizer medicines | 173 | 24.7 |
| 7 | Vertigo | 163 | 23.3 |
| 8 | Respiratory | 158 | 22.6 |
| 9 | Allergic rhinitis | 128 | 18.3 |
| 10 | Gout | 122 | 17.5 |
| 11 | Retinopathy | 118 | 16.9 |
| 12 | Thyroid | 118 | 16.9 |
| 13 | Anemia | 112 | 16.0 |
| 14 | Vit K deficiency | 91 | 13.0 |
| 15 | Parkinson's disease | 87 | 12.4 |
| 16 | Gastritis | 64 | 9.2 |
| 17 | Pneumonia | 16 | 2.3 |
| 18 | Antifungal drugs | 8 | 1.1 |




**Picture 3: Prevalance of Co-morbidity**

According to the table it is clearly visible that hyperlipidemia is the most common co-morbidity affected to DM patients. It is found that 615 patient were affected to this particular problem, that is about 88.0% of DM patients who attended the studies had hyperlipidemia

Hypertension is the next in the list. It is clear that about 594 patients, which are 85.0% of DM patients, were having the co-morbidity hypertension too. The table says about 291 patient were affected by nephropathy, about 41.6% calcium deficiency is the next most commonly occurring co-morbidity. About 286 were affected by this problem. That is about 40.9%.

The table next says about neuropathy, 284 were affected by the disease that is a total of 40.6%.then about 173 was victim of mood stabilizer. That is 24.7%. The next common co-morbidity, according to the table was vertigo, 163 were reported to

be vertigo patents (23.3%). Respiratory diseases were the next and 158 patient that is 22.6% were affected to this problem.

Patient with allergic problem was 128 that make a percentage of 18.3. Thenext in the list is gout. 122 were victims of the disease, which is 17.5%. Retinopathy is the next in the list 118 patient suffered from the retinopathy. That is 16.9%.the table also says that thyroid deficiency also had the same number of affected patient that of retinopathy. That is 118 and 16.9%. About 112 people had anemic problem that is a total percentage of 16 % had anemia among the DM patient who were taken for the studies. Vitamin k deficiency comes next in the list 91 patient were affected. That is about 13% had vitamin k deficiency.

The table says that 87 suffered from Parkinson's disease, which is 12.4%. Next in the list is gastritis. The table indicate that 64 were affected by this problem (9.2%). Pneumonia comes second last in the list; only 10 were affected to the disease during the study, which is 2.3%.antifungal problem were the other co-morbidity, only 1.1% had these co-morbidity table says that only 8 patient had this problem.

**CO-MORBIDITY IN FEMALES**

Table 5 gives a detail idea about the co-morbidities with DM, affected in females. The table gives an idea about the number of female patients affected by different co-morbidities. The total percentages of affected females are also given. The data is then arranged in a descending order.

The table gives the information that most number of females was affected with hypertension. About 88.2% were affected with hypertension. That is 267

patients had the disease. The next in the list is hyperlipidemia.263 patients were reported to have this co-morbidity (37.6%)

Nephropathy comes next in these list 175 patients, which are 25% had this problem. Deficiency of calcium was also seen. About 18.3% that is around 128 patients had calcium deficiency. Neuropathy is the next; it was reported in 120 patients with a total percentage of 17.2 suffering from this co morbidity.

**Table5: Prevalence of co-morbidity in female patients**

| Sl no | Co-morbidity | Female | |
|---|---|---|---|
| | | No of patients | % To Total |
| 1 | Hypertension | 267 | 38.2 |
| 2 | Hyper lipidemia | 263 | 37.6 |
| 3 | Nephropathy | 175 | 25.0 |
| 4 | Calcium deficiency | 128 | 18.3 |
| 5 | Neuropathy | 120 | 17.2 |
| 6 | Mood stabilizer medicines | 88 | 12.6 |
| 7 | Vertigo | 87 | 12.4 |
| 8 | Respiratory disorder | 76 | 10.9 |
| 9 | Thyroid | 71 | 10.2 |
| 10 | Gout | 60 | 8.6 |
| 11 | Allergic rhinitis | 57 | 8.2 |
| 12 | Retinopathy | 52 | 7.4 |
| 13 | Anemia | 44 | 6.3 |
| 14 | Vit K deficiency | 43 | 6.2 |
| 15 | Parkinson's disease | 37 | 5.3 |
| 16 | Gastritis | 33 | 4.7 |
| 17 | Pneumonia | 6 | 0.9 |
| 18 | Antifungal drugs | 2 | 0.3 |

Mood stabilizer problem was seen in 88 female patients (12.6%). The table also shows that 87 patients that are about 12.4% had the problem of vertigo. Respiratory problem are the next most commonly occurring co morbidity among female patients.10.9% that is about 76 were suffering from this problem. Thyroid

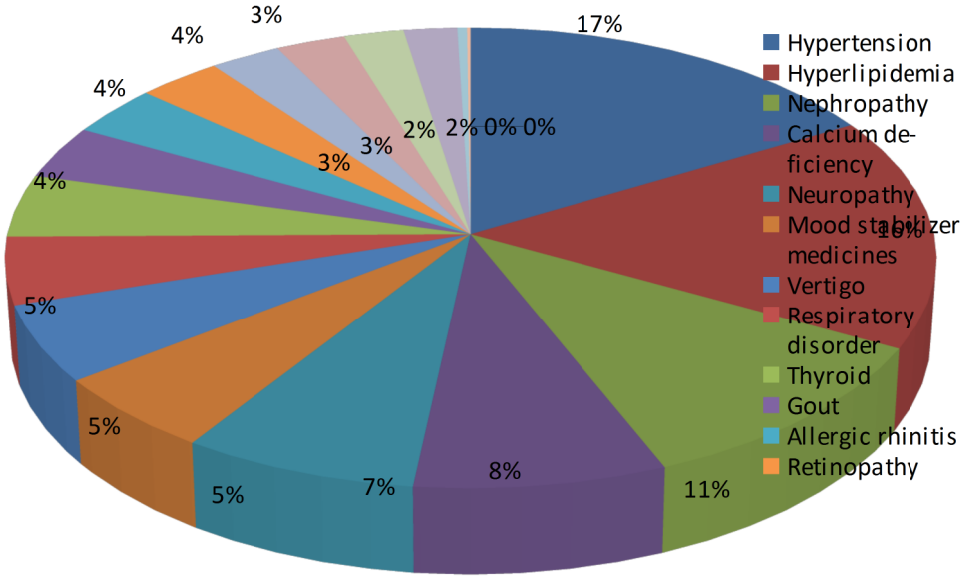
problem were seen in 71 patients that I a percentage of 10.2 suffers from thyroidproblem.

According to the table gout comes next. 60 patients were found to be victim of the disease (8.6%). The table clearly shows that allergic problems were seen in 57 patients and retinopathy in 52. That becomes a total of 8.2 % allergic and 7.4% of retinopathy patients.

The next most commonly occurring co-morbidities is anemia was observed in 44 female patients, 6.3% was anemic patients. Vitamin K deficiency occurs next in the table 43 suffered from this problem .that is about 6.2 % of total female patients were deficit to vitamin K.

Parkinson's disease and gastritis was observed in 37 and 33 patients respectively. That is about 5.3 and 4.7 % female patient were suffering from these disease respectively .pneumonia takes the second last position of the most commonly occurring co-morbidity, only 6 were affected to this problem (0.9%)

Antifungal disease is the least occurring co-morbidity among female only 2 wasfound to be affected, that is only a percentage of 0.3.




**Picture 4: Prevalence of co-morbidity in female patients**

## CO-MORBIDITY IN MALES

Table 6 detailed says about the co-morbidity range in male patients. The table has the co-morbidities which were found in male patients, arranged in descending order of number of patients affected. In the table it is listed that hyperlipidemia is the most commonly or largely occurring. Co-morbidities among male patients 342 patients were reported by the disease that is about 48.9%. The next position is given to hypertension. According to the table 327 male were victim of hypertension. That is about 46.8%

**Table 6:Prevalence of co-morbidity in male patients**

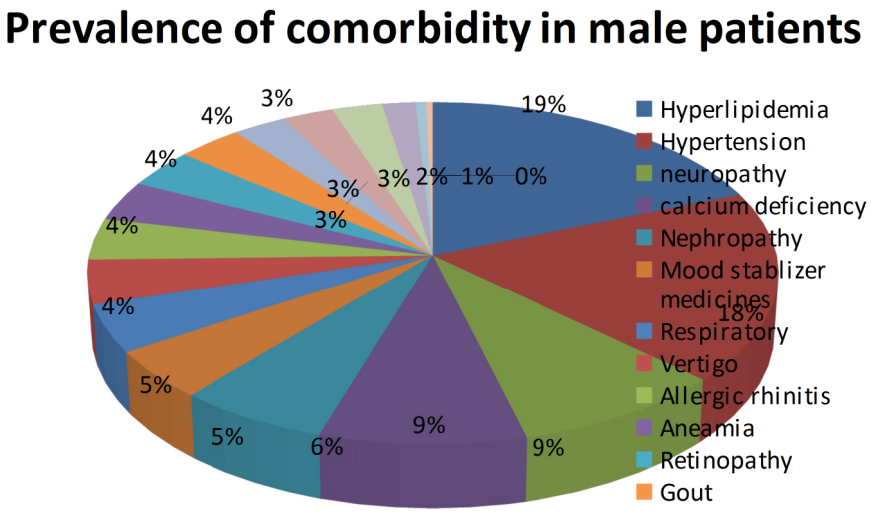
| Sl no | Co-morbidity | Male | |
|---|---|---|---|
| | | No of patients | in % |
| 1 | Hyperlipidemia | 342 | 48.9 |
| 2 | Hypertension | 327 | 46.8 |
| 3 | Neuropathy | 164 | 23.5 |
| 4 | Calcium deficiency | 158 | 22.6 |
| 5 | Nephropathy | 116 | 16.6 |

| | | | |
|---|---|---|---|
| 6 | Mood stabilizer medicines | 85 | 12.2 |
| 7 | Respiratory | 82 | 11.7 |
| 8 | Vertigo | 76 | 10.9 |
| 9 | Allergic rhinitis | 71 | 10.2 |
| 10 | Anemia | 68 | 9.7 |
| 11 | Retinopathy | 66 | 9.4 |
| 12 | Gout | 62 | 8.9 |
| 13 | Parkinson's disease | 50 | 7.2 |
| 14 | Vit K deficiency | 48 | 6.9 |
| 15 | Thyroid | 47 | 6.7 |
| 16 | Gastritis | 31 | 4.4 |
| 17 | Pneumonia | 10 | 1.4 |
| 18 | Antifungal | 6 | 0.9 |

The table says that 169 patients (23.5) had neuropathy and 158 patients (22.6%) were affected by calcium deficiency. nephropathy takes the next position with about 116 patients getting affected. That is about 176.6 % of males patients had nephropathy.

Mood stabilizer medicines were seen in 85 male patients (12.2%. Respiratory problem was the next most commonly occurring disease; about 32 patients had respiratory problems (11.7%).The table describes that vertigo was affected to 76 and allergic problem was seen in 71 males respectively. That may be about 10.9% of vertigo patients and 10.2% of allergic patients. Anemia is the next co-morbidity it was seen that 68 patients (9.7%) were anemic in the overall male patient seen. Retinopathy was observed in 66 male patients which makes about 9.4%o of male retinopathy patients. Gout and Parkinson's disease was observed in 62 and 50 patients respectively. Thus 8.9% of male patients had gout and 7.2%had Parkinson's disease.

Vitamin K deficiency comes in the list 48 were found affected (6.9%). Thyroid problem was found in 47 male patients (6.7%). The table determines that gastritis occurred in 31 males. That is a percentage of 4.4. Pneumonia takes the second least position in the table with 10 affected patients (1.4%). Antifungal problems takes the last position in the table with only 6 people affected and makes a percentage of 0.9 affected male.




**Picture 5: Prevalence of co-morbidity in male patients**

**PATIENT AWARENESS PROGRAM**

Keepingthesefactors in mind. It is very necessary to organize a patient education program. Through which a detailed study about the DM patients and co-morbidities were conducted.

The need for organizing such a program was to make the people aware about these diseases and its deadly effects which may be caused if not treated properly at proper time. In the program leaflets were created on the basis of the co-morbidities and distributed among the patients. Making them aware about the disease, for that

counseling program was also organized among the patient to used their knowledge about these co-morbidities and proper instructions were given to them.

From these studies and counseling it was clear that most of the patients were unaware about the co-morbidities, which can be affecting along with DM. Most of the peoples are not much bothered about these diseases which can be very dangerous in some cases if untreated.

The people are mostly busy with their works and day to day activities while most of them are often forgetting to do maintaining a healthy life style. The changing of people towards western culture and fast foods etc. has become a good reason for such a large rate of DM patients and other dangerous co-morbidities which can accompany them.

Patient education program conducted and the each and every data and values regarding co-morbidity, and the patients were recorded carefully before and after the program.

The recorded values before and after the patient education program were compared carefully to determine whether there was any recordable changes in the data.

The result was that there was a significant decrease in the co morbidity range of the patients. After the program the percentage of people in each co morbidity change was decreased in a notable manner and it was also found that many patients who attended the program before to take proper steps to stay away from these co-morbidities and live a healthy life. Most of the people began to control their food and also began to do exercises.

Patients with hypertension, anemic and such co-morbidities began to control their food and also began to have regularcheck up. People understood about the dangerous of these co-morbidities and that significant changes were seen.

From the dates it was clear that many patents for eg. Mainly neuropathic patients began to be concerned about the problem of the diseases and take steps to prevent foot ulcer.

From the dates and record eel changes if was clear that most of the people were able to understand the importance of co-morbidities and their prevention steps. From the data if can also be clear that our program had a good impact on the patients and the program was a success.

**THE IMPACT OF PHARMACIST'S PATIENT EDUCATION PROGRAM**

The table clearly describes about the diabetes co-morbidities, about its mean intervention. The table also says about the standard deviation and the P value of the data regarding the co-morbidities. The table also says about the significance of the co-morbidities.

**Table 7. : The impact of pharmacist's patient education program**

| Co-morbidities | Intervention | Mean | SD | P value | Significant |
|---|---|---|---|---|---|
| Retinopathy | before | 3.63 | 1.26 | 0.0001 | S |
| | after | 4.71 | 1.87 | | |
| Nephropathy | before | 3.64 | 1.44 | 0.0001 | S |
| | after | 4.64 | 1.40 | | |
| Neuropathy | before | 2.91 | 1.08 | 0.0001 | S |
| | after | 4.28 | 1.03 | | |

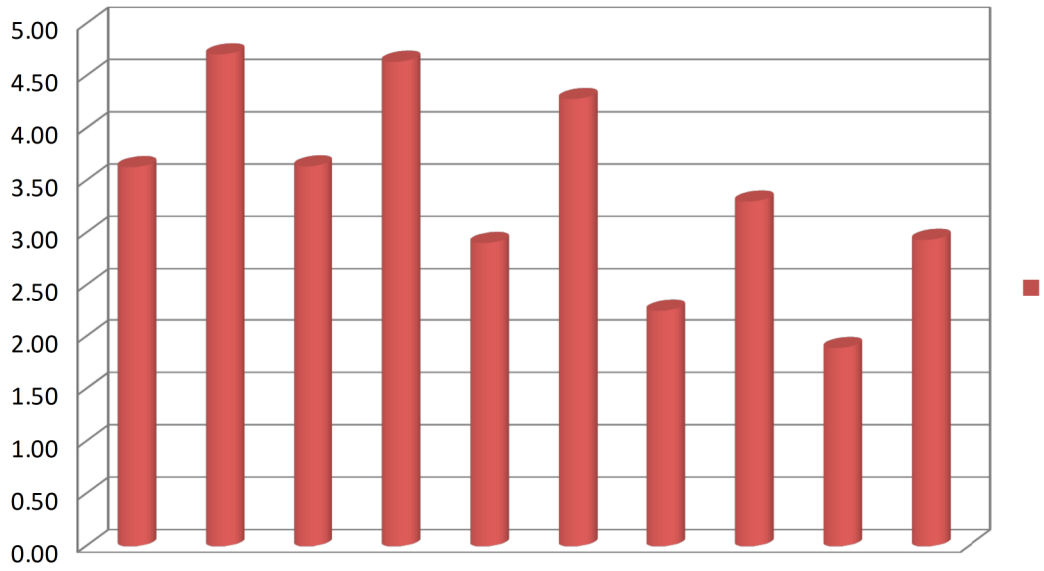
| | | | | | |
|---|---|---|---|---|---|
| Hypertension | before | 2.26 | 1.07 | 0.0001 | S |
| | after | 3.30 | 1.01 | | |
| Hyperlipidemia | before | 1.89 | 1.03 | 0.0001 | S |
| | after | 2.94 | 0.94 | | |

The mean difference of different intervention (before and after the patient education program) can also be calculated from the table and the percentage can also be determined if necessary. The table distinctly describes about the 5 co-morbidities which includes retinopathy, nephropathy, neuropathy, hypertension and hyper lipidemia. The mean and SD are described on the basis of the two intervention, that is before and after the patient education program.

According to the table the mean value of retinopathy affecter patients before the patient education program was 3.632 and after was 4.71, the men difference was found to be 1.078. The calculated standard deviation was about 1.26 and 1.87 before and after the program respectively. The p value was calculated as 0.0001 and was found to be significant. In case of nephropathy the mean value was noted to be 3.64 before the program and 4.64 after, thus the mean difference is 1. The SD was recorded as 1.440 and 1.07 respectively before and after the program, the P value is 0.0001 and thus was found to be significant. The mean value is 2.907 and 4.283 for before and after intervention for neuropathy, the mean difference of the co-morbidity is 1.376 and the SD before the program was 1.82 and after was 1.035 for neuropathy. The P value was found to be 0.0001 so it is significant.

Hypertension, very common and deadly co-morbidity among diabetes affected people. 2.259 was the mean value before and 3.303 was the value after patient education program, the mean difference was 1.044 and SD was 1.07 and 1.010 before and after respectively. It is significant and the P value was 0.0001.

In the case of hyper lipedemia the mean value is 1.894 and 2.937 with a difference of 1.042 the SD of the co-morbidity recorded is 1.038 before the patient education program and 0.946 after the program. The P value is 0.0001 and is significant. From the table it is clear that the P value of all the 5 co-morbidities was 0.0001. Since the P value is below 0.5 it can be said that all the co-morbidities described in the table are significant.




**Picture 7: The impact of pharmacist's patient education program**

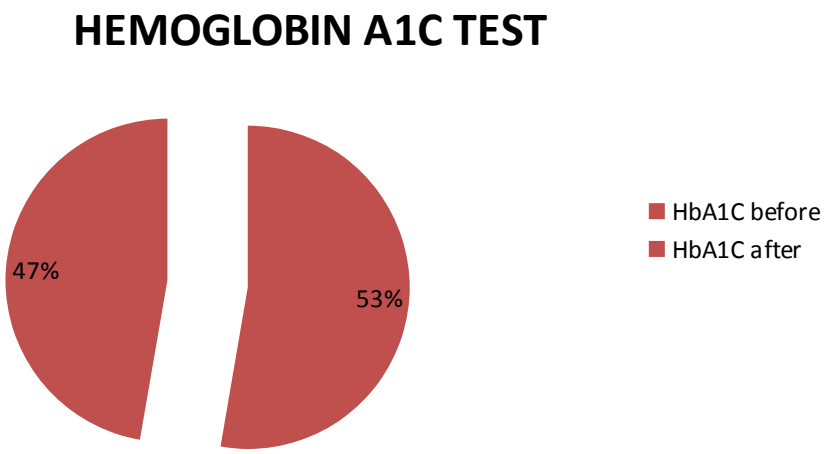
**HEMOGLOBIN A1C TEST**

**Table 8: HbA1c test before and after patient education program.**

| Lab test | Grand Total | % To Total |
|---|---|---|
| HbA1C before | 5856.4 | 837.83 |
| HbA1C after | 5255.3 | 751.83 |

The Hba1c level data also has a significant impact by the clinical outcome of the studies and patient education program. It was found that the Hba1c level before program was 5856.4, that is about 53%, and the level after the program was 5255.3, the percentage level was reduced to 47%.thus the clinical outcome of the studies and patient education program has reduced the % level of Hba1c by 6%.

From these data, all these co-morbidities were significant and Hba1c level has also reduced to a notable level due to patient education program, thus the program could make a remarkable effect on diabetes affected patient who were used for these studies.




**Picture 8: HbA1c test before and after patient education program**

# CONCLUSION

The main objective of the study was to study the prevalence of co-morbidities in type 2 DM. The awareness level of people and the impact of pharmacist patient education program were also studied in detail. Implementation of the patient education program on the co-morbidities among the type 2 DM patients was also an aim of the study conducted.

Detailed surveys about the diabetes affected patients and the co-morbidities were studied and recorded, the no of people affected to different co-morbidities were separately studied and their percentage were calculated,also their percentage after the studies and the patient education program were compared and noted.

The impact of the patient education program on the awareness level of patient was found out. The significance level of the co-morbidities were found out, from these data it was seen that all the co-morbidities were having the P value of about 0.0001, which is below 0.05 thus it was determined that the intervention by the Pharmacist was significant & outcome was positive.

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**PREVALENCE OF CO-MORBIDITIES IN TYPE 2 DIABETES MELLITUS PATIENTS, THE AWARENESS LEVEL AND THE IMPACT OF PHARMACIST'S PATIENT EDUCATION PROGRAM**

**NAME: _____** **AGE: _____**

**SEX: _____** **EDUCATION: _____**

**MOBILE NUMBER: _____** **HEIGHT (in cm): _____**

**WEIGHT (in kg): _____** **BMI: _____**

**BMI CLASS: _____**

**DIABETES DIAGNOSED 1ST ON: _____**

**MEDICATION PRESCRIBED**

| | Name of the medicine | Dose schedule |
|---|---|---|
| | | |
| | | |
| | | |

**LAST THREE READING LAB REPORTS**

| | | | | | | |
|---|---|---|---|---|---|---|
| **HbA1C** | **Date** | | | | | |
| | **Value** | | | | | |
| **Pre-prandial** | **Date** | | | | | |
| | **Value** | | | | | |
| Post-prandial | **Date** | | | | | |
| | **Value** | | | | | |

## PATIENT CONSENT / ASSENT FORM

I have read/been briefed on the study "**Prevalence of co-morbidities in type 2 diabetes mellitus patients, the awareness level and the impact of pharmacist's patient education program At Malappuram District, Kerala"** and I voluntarily agree to participate in this study which may or may not be beneficial me. Its general purpose, potential benefits, possible hazards, and inconveniences have been explained to me up to my satisfaction. I have the option to withdraw from the study at any stage. I here by give my consent for this study.

Rm³ CXp-hm-bn¨p a\-Ên-em¡n "**Prevalence of co-morbidities in type 2 diabetes mellitus patients, the awareness level and the impact of pharmacist's patient education program At Malappuram District, Kerala"** F¶ Cu ]T\¯nsâ Cu `mK-am-sW¶v kzta-[b a\-Ên-em-¡p-¶p. ]n¶oSv {]tXy-In¨v ImcWw ImWn-¡msX Xs¶ F\n¡v CXnÂ \n¶pw ]n³·m-dm³ Ah-Im-i-ap-v. Cu ]T-\-¯nsâ `mK-am-hm³ Rm³ k½-Xn-¡p-¶p F¶v km£y-s¸-Sp-¯p-Ibpw sN¿p-¶p.

Name of Patient: Signature of patient

Place:

Date:

## HYPER TENSION

**1. Are you aware that uncontrolled diabetes can complicate hypertension?**

**ZoÀL-Im-e- {]-talw càk-½À±w IqSm³ Imc-W-am-¡p-¶Xv \n§Ä¡vAdnbmtam ?**

| | | | |
|---|---|---|---|
| Yes | | N<br>No | |

**2. Are you feeling dizziness or vertigo?**

**\n§Ä¡vXe-I-d¡w A\p-`-h-s¸-Sm-dp-tm ?**

| | | | |
|---|---|---|---|
| Yes | | N<br>N<br>o | |

**3. Do you sweat suddenly with out any reason?**

**\n§ÄHcpImc-WhpwCÃmsX s]s«¶vhnbÀ¡m-dptm ?**

| | | | |
|---|---|---|---|
| Yes | | N<br>N<br>o | |

**4. Do you feel confused all time?**

**\n§Ä¡vAe-kX A\p-`-h-s¸-Sm-dptm ?**

| | | | |
|---|---|---|---|
| Yes | | N<br>N<br>o | |

**5. Has your breath become shorter?**

**\n§Ä¡v {]tXyIImcWwanÃmsXXs¶ izmkwFSp-¡p-¶-XnÂ _p²n-ap-v A\p`-h-s¸-Sm-dptm ?**

| | | | |
|---|---|---|---|
| Yes | | N<br>N<br>o | |

## NEUROPATHY

**1. Are you aware that uncontrolled diabetes can affect Neuropathy?**
**ZoÀL-Ime {]talw \mSn -kw-_ÔambAkp-J-¯n\v Imc-W-am-Ip-sa¶v \n§Ä¡-dn-bmtam ?**

| | | | |
|---|---|---|---|
| Yes | | N N o | |

**2. Can you feel the sensation of that on your foot?**
**\n§-fpsSImenÂsXmSp¶ kv]Ài\w Adnbm³ km[n-¡m-dptm?**

| | | | |
|---|---|---|---|
| Yes | | N N o | |

**3. Have you felt any swelling or edema on you legs?**
**ImenÂ \ntcmAsÃ-¦nÂXSnt¸mhcm-dptm ?**

| | | | |
|---|---|---|---|
| Yes | | N N o | |

**4. If there is a cut/injury? in your feet does it heat as usual?**
**IenÂapdnhvh¶mÂ km[m-cW DW-§-¶Xv t]mseAXvDW§mdptm ?**

| | | | |
|---|---|---|---|
| Yes | | N N o | |

**5. Are you aware of precautions to be taken for prevention of diabetes foot ulcer?**
**{]talwaqewDm-Ip¶ Imenseapdnhvhcm-Xn-cn-¡m-\pÅamÀK-§Ä \n§Â¡-dn-bmtam ?**

| | | | |
|---|---|---|---|
| Yes | | N N o | |

## RETINOPATHY

**1. Are you aware that uncontrolled diabetes can affect your vision?**

**ZoÀL-Ime {]talwImgvNsb _m[n¡p-¶p F¶Xv \n§Ä¡-dn-btam ?**

| | | | |
|---|---|---|---|
| Yes | | N N o | |

**2. Have you felt that your vision is decreasing suddenly?**

**\n§Ä¡vImgvN s]s«¶vIpd-bp-¶-Xmbn A\p-`-h-s¸-«n-Sptm ?**

| | | | |
|---|---|---|---|
| Yes | | N N o | |

**3. Have you felt that your vision is becoming smoky or cloudy?**

**\n§-fpsSImgvN ]pIaqSn-bXv t]msetbmAsÃ-¦nÂ s]mSn-]-S-e-¯n-\n-S-bn-eq-sStbmt\m¡p-¶Xv t]mse A\p-`-h-s¸-«n-Sptm ?**

| | | | |
|---|---|---|---|
| Yes | | N N o | |

**4. Are you feeling paining in eye ball?**

**\n§fpsSI®nsâ a[y-`m-K¯vthZ\ hcm-dptm ?**

| | | | |
|---|---|---|---|
| Yes | | N N o | |

**5. Can you read properly?**

**\n§Ä¡vIrXy-ambnhmbn-¡m³ Ign-bp-¶ptm ?**

| | | | |
|---|---|---|---|
| Yes | | N N o | |

**6. Do you have headache normal vision?**

**\n§Ä¡v k[m-cWhmbn-¡p-t¼mÄ Xe-th-Z\ hcm-cptm ?**

| | | | |
|---|---|---|---|
| Yes | | N N o | |

## NEPHROPATHY

**1. Are you aware that uncontrolled diabetes can affect your kidney?**

**\nb-{´-W-an-Ãm¯ {]talwhr¡-tc-K-¯n\v Imc-W-am-Ip-¶Xv \n§Ä¡vAndnbmtam ?**

| | | | |
|---|---|---|---|
| Yes | | No | |

**2. Are you feeling tired and weak?**

**\n§Ä¡vAkz-`m-hnI £oWw A\p-`-h-s¸-Sm-dptm ?**

| | | | |
|---|---|---|---|
| Yes | | No | |

**3. Is your appetite poor?**

**\n§Ä¡vhni¸vIpdhv A\p-`-h-s¸-«n-«ptm ?**

| | | | |
|---|---|---|---|
| Yes | | No | |

**4. Is there is edema or swelling on your legs?**

**\n§-fpsSImenÂ \ntcmAsÃ¦nÂXSnt¸m A\p-`-h-s¸-«n-Sptm ?**

| | | | |
|---|---|---|---|
| Yes | | No | |

**5. Are you having any kind of discomfort for urination?#S**

**\n§Ä¡vaq{X-sam-gn-¡p-t¼mÂ GsX-¦nepwcoXn-bn-epÅ _p²n-ap«v A\p`h-s¸-«n-«ptm ?**

| | | | |
|---|---|---|---|
| Yes | | No | |

**6. Do you feel any trouble while sleeping?**

**Xm¦Ä \ÃXv t]mseDd-§-dptm ?**

| | | | |
|---|---|---|---|
| Yes | | No | |

## HYPERLIPIDEMIA

1. **Are you aware that uncontrolled diabetes can complicate hyper lipidemia?**
   **\nb-{´-W-an-Ãm¯ {]talwsIgp¸vk_Ô-ambAkp-J-¯n\v Imc-W-am-¡p-¶Xv Adn-bmtam ?**

| | | | |
|---|---|---|---|
| Yes | | N<br>N<br>o | |

2. **Has your weight increased suddenly?**
   **ASp-¯-Im-e-¯mbn s]s«¶v \n§fpsSicoc `mcwIqSn-bn-«pt-m ?**

| | | | |
|---|---|---|---|
| Yes | | N<br>N<br>o | |

3. **Is your knee and angle joint paining?**
   **\n§-fpsSImÂap«n\pw tPmbânepwthZ-\-h-cm-cptm ?**

| | | | |
|---|---|---|---|
| Yes | | N<br>N<br>o | |

4. **Is your chest paining?**
   **ITn-\-ta-dnbtPmen sN¿p-t¼mÄ AsÃ-¦nÂhymgmaw sN¿p-t¼mÂ s\©v thZ\ Dm-Im-dptm ?.**

| | | | |
|---|---|---|---|
| Yes | | N<br>N<br>o | |

# Diabetic Neuropathy

## What is diabetic neuropathy ?

**Daibetic neuropathy is a complication of long standing diabetes,which affects the nerves of the body, which affect all the tissuesand the organs of the body. Initially systems cannot be obseved, but later pain, numbness or loss of feeling in hands,arm,feet and legs can be observed**

**If you have diabetes** there are several other precautions you should take.

- All diabetics should get regular (at least twice yearly) foot exams by their health care provider. This includes a monofilament test to check sensitivity.
- If you have diabetes, check your feet every day. Inspect the top, sides, soles, heels and between the toes. If you can't see your feet, use a mirror to check them. Report sores, blisters, bruises, cuts or areas of redness.
- Wear socks and shoes at all times to protect the feet from injury.

## Diabetic foot care..

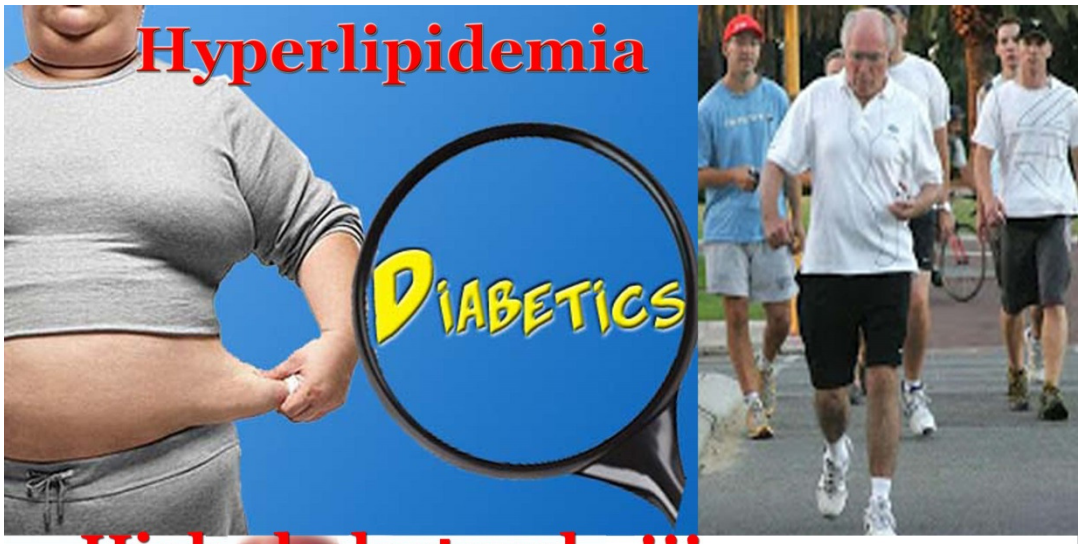
**Let your foot be as important as your face**

**Footwear advice**

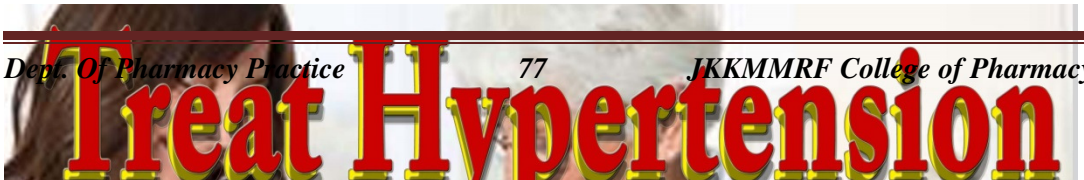
In some cases foot ulceration can be prevented by choosing correctly fitting shoes.

prevent
kidney disease
Diabetes is the most common cause of kidney disease
ATTENTION
People with Diabetes and Hypertension
Prevent chronic kidney diseas
Take a Rs.30 for urine test...
and protect yourself against dalysis that could
cost you Rs.2.5 lakhs a year....
If you have hypertension or are diabetic, regularly check your urine for presence of Albumin.
Risk factor for diabetic kidney disease
. When the medicines for the DM are not consumed at proper time
. Smoking
. high blood pressure
. hyperglycemia (high levels of glucose in the blood)
. Family history of diabetic kidney diseae
Diabetic kidney disease develops in one third of all people with diabetes
Decrease salt

Diabetic Eye Disease
The longer you have diabetes.....
the higher your risk of getting diabetic eye disease...!!!
What is it?
It refers to eye problems people with diabetes may have. These include
Cataract
Clouding of the lens of the eye.
Diabetic retinopathy
Damage to blood vessels in the retina; most common.
Glaucoma
Damage to the optic nerve.
There are often NO early warning signs.
Vision with Diabetic Retinopathy
Normal Vision
Normal
Disease
How is it detected?
Through a comprehensive dilated eye exam
What can you do to protect your vision?
1 Take your medications as prescribed by your doctor.
2 Reach and maintain a healthy weight.
3 Add more physical activity to your daily routine.
4 Control your ABCs— A1C, blood pressure, and cholesterol levels.
5 Exam your eye Yearly...


Hyperlipidemia
DIABETICS

High cholesterol...!!!
Red blood cell
LDL (bad cholesterol)
HDL (good cholesterol)
White blood cell
Healthy artery
Artery with plaque buildup
LDL sticks to artery walls and adds to plaque buildup
HDL is stable and carries LDL away from artery
Normal interior view of artery
Red blood cell
Cholesterol
Bad Eating Habits
Keep your health on TRACK:
Take your medications.
Reach and maintain a healthy weight.
Add physical activity to your daily routine.
Control your blood sugar, blood pressure, and cholesterol.
Kick the smoking habit.


Treat Hypertension

Diabetic Eye Disease
നിങ്ങൾക്ക് ദീർഘകാലമായി പ്രമേഹമുണ്ടോ ?
അങ്ങനെയെങ്കിൽ പ്രമേഹമൂലമുള്ള കണ്ണിന്റെ
തകരാറിനുള്ള സാധ്യത കൂടുതലാണ്.
പ്രമേഹം രോഗികൾക്ക്
അതുമൂലമുണ്ടാകുന്ന
കണ്ണിന്റെ തകരാറ്
തിമിരം
കണ്ണിന്റെ ലെൻസ്
കട്ടികൂടുന്നു.
Vision with Diabetic Retinopathy
Normal Vision
പ്രമേഹ റെറ്റിനോപതി
റെറ്റിനയിലെ രക്തകുഴലുകൾക്ക്
തകറാണ് സംഭവിക്കുന്നു.
ഇത് വളരെ സാധാരണയുള്ളത്.
സാധാരണ
അസുഖം ബാധിച്ചത്
ഗ്ലൂക്കോമ
ഒപ്റ്റിക് നാഡിക്കുള്ള
തകരാറ്
നിങ്ങളുടെ കാഴ്ച സംരക്ഷിക്കാൻ നിങ്ങൾ എന്ത് ചെയ്യണം ?
എങ്ങനെ ഇത് കണ്ടെത്താം..?
1 ഡോക്ട്ടർ നിർദ്ദേശിച്ചിട്ടുള്ള മരുന്നുകൾ ശരിയായ രീതിയിൽ കഴിക്കുക.
2 ആരോഗ്യകരമായ ശരീരഭാരം നിലനിർത്തുക.
3 വ്യായാമം ദിനചര്യയുടെ ഭാഗമാക്കുക.
4 നിങ്ങളുടെ Hb A1C,രക്തസമ്മർദ്ദം, കൊളസ്ട്രോൾ എന്നിവ കൃത്യമായി ചെക്ക് ചെയ്യുക.
5 മാസം തോറും നിങ്ങളുടെ കണ്ണ് പരിശോധനക്ക് വിധേയമാക്കുക.
ഒരു വിശദമായ കണ്ണുപരിശോധനയിലൂടെ

Treat Hypertension
STOP
നിങ്ങൾ അമിതമായി ഉപ്പ് കഴിക്കുന്നു.
രക്തസമ്മർദ്ദം കുറക്കുന്നതിലൂടെ
ഹൃദയത്തെ സംരക്ഷിക്കൂ...
പ്രമേഹവും രക്തസമ്മർദ്ദവും
കൂടുതലുള്ള വരുടെ ശ്രദ്ധക്ക്
നിങ്ങൾക്ക് BP യും
പ്രമേഹവും ഉണ്ടെങ്കിൽ
മൂത്രം പരിശോധിച്ച്
ആൽബുമിൻ ഉണ്ടോ
എന്ന് പരിശോധിക്കുക.
എങ്ങനെ എനിക്ക് അധിക രക്തസമ്മർദ്ദത്തെ
ജീവിത രീതിയിൽ ചികിത്സിച്ച്മാറ്റാം
മരുന്ന് കഴിക്കുക
ശരീര ഭാരം
കുറയ്ക്കുക
സ്ഥിരമായ വ്യായാമം
പുകവലി നിർത്തുക
ഡോക്ട്ടറെ
കാണുക
ആരോഗ്യകരമായ
ഭക്ഷണം
ഉപ്പിന്റെ അളവ്
കുറയ്ക്കുക
മദ്യത്തിന്റെ ഉപയോഗം
നിയന്ത്രിക്കുക.

# പ്രമേഹമൂലമുള്ള വൃക്കരോഗത്തെ തടയൂ..

വൃക്കരോഗത്തിന്റെ വളരെ സാധാരണമായികാണുന്ന കാരണത്തിലെന്നാണ് പ്രമേഹം.

**പ്രമേഹരക്തസമ്മർദ്ദം ഉള്ളവരുടെ ശ്രദ്ധയ്ക്ക്**

ദീർഘകാലമായുള്ള വൃക്കരോഗം വരാതെ തടയാൻ മൂത്ര പരിശോധനയ്ക്ക് വേണ്ടി 30 രൂപ ചിലവഴിക്കൂ.
ഡയാലിസിസ്ന് വേണ്ടിയുള്ള 2.5 ലക്ഷം ഒരു വർഷം ലാഭിക്കുകയും അതിലൂടെ വൃക്കരോഗം വരാതെ സൂക്ഷിക്കൂ....

**വൃക്കരോഗം ഉണ്ടാകാനുള്ള കാരണങ്ങൾ.**

1. പുകവലി
2. ഉയർന്ന രക്തസമ്മർദ്ദം
3. ഉയർന്ന പ്രമേഹത്തിന്റെ അളവ്
4. പാരമ്പര്യം
5. പ്രമേഹ രോഗത്തിനുള്ള മരുന്ന് കൃത്രമായി കഴിക്കാതെ വരുമ്പോൾ

**പ്രമേഹ – വൃക്കരോഗം മൂന്നിൽ ഒരു പ്രമേഹ രോഗിയിൽ കണ്ടുവരുന്നു.**

HYPER LIPIDEMIA
പ്രമേഹം
ഉയർന്ന കെളസ്ട്രോൾ ലെവൽ
രക്തകുഴലിന്റെ ഉൾവശം
Red blood cell
ആരോഗ്യകരമായരക്തധമനി
LDL (bad cholesterol)
HDL (good cholesterol)
White blood cell
Red blood cell
Cholesterol
കൊഴുപ്പ് അടിഞ്ഞ രക്തധമനി
LDL sticks to artery walls and adds to plaque buildup
HDL is stable and carries LDL away from artery
തെറ്റായഭക്ഷണശീലം
നിങ്ങളുടെ ആരോഗ്യം ശരിയായി സൂക്ഷിക്കുക
മരുന്ന് കഴിക്കുക
മിതമായും ആരോഗ്യ കരവുമായ ശരീരഭാരം നിലനിർത്തുക
വ്യായാമം ദിനചര്യയുടെ ഭാഗമാക്കുക
ബ്ലഡും, ഷുഗറും, കൊളസ്ട്രോളും പരിശോധിക്കുക.
പുകവലി ഉപേക്ഷിക്കുക

# Diabetic Neuropathy

## എന്താണ് ഡയബെറ്റിക്ക് ന്യൂറോപതി ?

ദീർഘകാലമായതും പഴകിയതുമായ പ്രമേഹം ശരീര നാഡികളെയും മറ്റു ശരീര വയവങ്ങളെയും ബാധിക്കുന്നത് മൂലമുണ്ടാകുന്ന അനന്തരഫലങ്ങളെയാണ് ഡയബെറ്റിക്ക് ന്യൂറോപതി എന്ന് പറയുന്നത്.

ഈ രോഗത്തിന്റെ തുടക്കത്തിൽ രോഗലക്ഷണങ്ങൾ പ്രകടമല്ല, എന്നാൽ രോഗത്തിന്റെ അവസാനഘട്ടത്തിൽ രേഗിക്ക് കയ്യിലും കാലിലും വേദന മരവിപ്പ്, സ്പർശനം അറിയാത്ത അവസ്ഥ പോലെയോ കാണപ്പെടുന്നു.

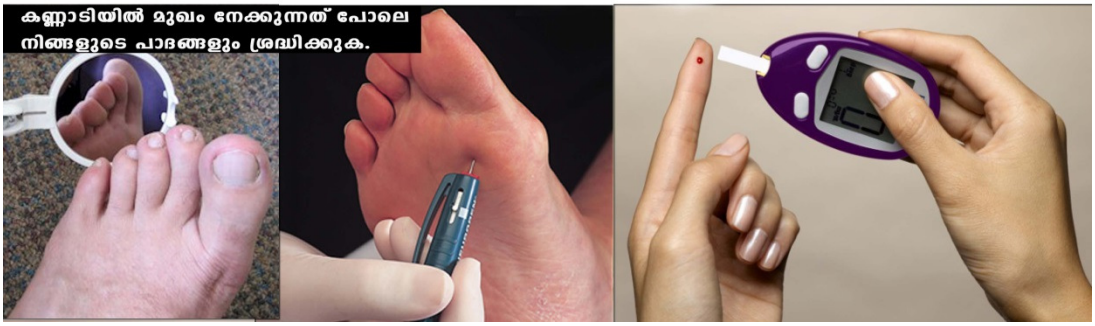
## നിങ്ങൽക്ക് പ്രമേഹമുണ്ടെങ്കിൽ നിങ്ങളെടുക്കേണ്ട മറ്റു ചില മുൻ കരുതലുകൾ

എല്ലാ പ്രമേഹരേഗികളും സ്ഥിരമായി അവരുടെ പാദങ്ങൾ ഒരു വ്യക്തിയുടെ സഹായത്തോടു കൂടി പരിശോധിക്കുക, ഇത്തരത്തിലുള്ള ഒരു ടെസ്റ്റാണ് മോണോഫിലമെന്റ്

പ്രമേഹമുള്ളവർ അവരുടെ പാദങ്ങൾ ദിവസ്സവും ടെസ്റ്റ് ചെയ്യുക. പാദത്തിന്റെ മുകൾ വശവും സൈഡും മടമ്പ് അടിഭാഗം വിരലുകളുടെ വിടവ് എന്നിവ കൃത്യതയോടെ പരിശോധിക്കണം.

മുറിവുകളോ കുമിളകളോ ചുവപ്പ് നിറത്തിലുള്ളതായ എന്തെങ്കിലും കണ്ടാൽ ഉടനെ ഡോക്ട്ടറെ സമീപിക്കുക.

സോക്സ്, ഷൂ എന്നിവ ധരിക്കുന്നത് പദസംരക്ഷണത്തിന് സഹായകരമാണ്.

## പ്രമേഹപാദ സംരക്ഷണം...

കൃത്യമായ അളവിലുള്ള പാദരക്ഷങ്ങൾ ധരിക്കുന്നത് വഴി കലിലെ മുറിവ് ഒരു പരിധിവരെ തടയാൻ സാഹായകമാവും