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A Prospective Observational Study: Prevalence of Comorbidities and Complications among Type 2 Diabetic Patients in a Tertiary Care Hospital, Ongole, Andhra Pradesh

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Abstract

The aim of the study is to assess the prevalence of comorbidities and complications of type 2 diabetes mellitus among patients in government general hospital, Ongole Andhra Pradesh. Objectives: To estimate the prevalence of co morbidities & complications in type 2 diabetic patients. To assess the significant relationship between duration of diabetes and complications. Methodology: Prospective observational studies that have been conducted on 800 patients in General medicine of a tertiary care hospital among the patients who adhere to criteria were registered in the study. The data was collected by using well designed proforma according to the criteria, the data was analyzed. Inclusion criteria: Diabetic patients > 18 years to <80 years are included. Exclusion criteria: Diabetic patients < 18 years to > 80 years are excluded. Patients with type 1 diabetes mellitus and gestational diabetes are excluded. Results: This study revealed that out of 800 patients, co-morbid Conditions are 407 (50%) are HTN patients, 109 (13.6%) are CLD patients, 96 (12%) are pancreatitis, 83 (10.3%) are dyslipidemia patients, 77 (9.6%) are Gastritis patients and 48 (6%) are CKD patients. Complications of type 2 Diabetes are 185 (23.1%) are CVD patients, 169 (21.1%) are CVA patients, 126(15.7%) are neuropathy patients, 123 (15.3%) are retinopathy patients, 113(14.1%) are nephropathy patients, 107 (13.3%) are Diabetic foot ulcer patients and 63(7.8%) are ketoacidosis patients. Duration of diabetes less than 5 years are major in number342 (42.7%) which contributes variation in the study190 (24%) are between 6-10 years, 120 (15%) are between 11-15 years, 80 (10 %) are between 16-20 years, 68 (9%) are having duration greater than 20 years. Conclusion **:** This study mainly focused in patients having duration of diabetes less than 5 years having complications of 0.8% patients with nephropathy, 2.1% patients with CVD, 1.8% with CVA, 1.2% with diabetic foot ulcer, 0.6% with ketoacidosis, 0.3% with retinopathy, 1% with neuropathy. Between 6-10 years of disease duration there are 2.5% with nephropathy, 3.3% with CVD, 3% with CVA, 2.2% with diabetic foot ulcer, 0.9% with ketoacidosis, 1.8% with retinopathy and 1.3% with neuropathy. In between 11-15 years duration with diabetes there are 3.8%,5%,4.4%, 2.9%, 1.5%, 3.2% and 3.5% with nephropathy, CVD,CVA, diabetic foot ulcer, ketoacidosis, retinopathy, and neuropathy respectively. As the duration of diabetes increases the occurrence of compliacations is also rises and leads to death.

Keywords: Type 2 Diabetes, CVD, CVA, Ketoacidosis,HTN.

Introduction

Diabetes is a group of metabolic disorders characterized by the presence of hyperglycemia in the absence of treatment. The heterogeneous aetio-pathology includes defects in insulin secretion (or) defects in insulin action, or both, and abnormality of carbohydrate, protein and lipid metabolism. Major complications occurring with diabetes include retinopathy, nephropathy and neuropathy. People suffering with diabetes are also at an increased risk of other diseases including cardiovascular and cerebrovascular diseases, obesity, cataracts, erectile dysfunction, and nonalcoholic fatty liver

disease and some pancreatic problems. They are also at an increased risk of some serious infectious diseases, such as tuberculosis.

HISTORY: The term diabetes comprises disorders characterized by hyperglycemia. Ebers papyrus, it was written around 1500 BC, excavated in the 1862 AD from an ancient grave in Thebes, Egypt and it was published by Egyptologist George Ebers in the year 1874 illustrates a condition ' 'Too great emptying of urine". Aretaeus of Cappadocia in 2nd century AD describes that "The fluid does not remain in the body but uses the man's body as a channel to leave it". He highlighted disease by the incessant flow of urine, unquenchable thirst, the melting down of flesh and limbs into urine. The hindu physicians, charak and sushrut who were written between 400 and 500 BC were the first persons to recognize, sweetness of diabetic urine. They also noted that disease was most prevalent in people who were indolent, overweight and gluttonous and who were indulged in sweet and fatty foods. The important fact that diabetic urine tastes sweet was also emphasized by Arabic medical texts from 9 to 11th centuries AD [1]. In the 20th century Frederick Banting and Charles Best discovered insulin in 1921. They made several pioneering efforts. This has become a life saving treatment for people with Type 1 diabetes. Treatment for Type 2 diabetes was discovered in the later years.

Epidemiology

The number of people with diabetes increased from 108 million in 1980 to 422 million in 2014. The global prevalence of diabetes among adults over 18 years of age increased from 4.7% in 1980 to 8.5% in 2014.Diabetes is one of the 10 leading causes of death of all non communicable diseases [2]. People with diabetes have 2-3 fold increased risk of mortality [3]. Globally the incidence of diabetes millets increased from 11.3 million in 1990 to 22.9 million in 2017. The age standardized incidence rate increased from 233.6 to 284.6 in 2017. Globally the prevalence of diabetes increased from 211.2 million in1990 to 476.0 million in 2017. The age standardized prevalence rate increased from 4738.5 to 5886.9 in 2017. Global death because of diabetes increased from 0.61 million in 1990 to 1.37 in 2017. The age standardized death rate increased from 15.7 to 17.5 in 2017. Global Disability adjusted life years increased from 31.3 million in 1990 to 67.9 million in 2017. Age standardized DALY rates increased from 717.7 to 839.0 in 2017. According to a 2017 survey the top highest prevalence countries of diabetes are China (89.5 million), India (67.8 million), Indonesia (21.0 million) and Mexico (13.1 million). Top five countries of death were India(2,54,555), China(1,53,185), Indonesia(97,000), US(68,558) Mexico(64,067). Five countries of DALY'S were India (11.2 million), China (10.0 million), Indonesia (4.4 million), us(3.9million) and Mexico(2.6 million). Among 217 risk factors the three major risk Factors for diabetes are high BMI, Dietary risk factors and particulate matter pollution[4].

Etiology

AGE: During the past 50 years, there has been a dramatic increase in life expectancy with a simultaneous increase in the prevalence of diabetes. Aging alone can cause decline in physiological function leading to chronic diseases, like diabetes mellitus, CVD, cognitive impairment, etc. The mechanisms linking advancing age to diabetes mellitus are complex. Asymptomatic hyperglycemia occurs in many people as they age and progressive metabolic dysregulation increases the susceptibility to many age-related chronic diseases, including CVD as well as CVA. Aging is by far the strongest known risk factor of diabetes mellitus and CVD [5]

Physical Inactivity "Any bodily movement produced by the contraction of skeletal muscle that increases energy expenditure above a basal level. Physical activity generally refers to the subset of physical activity that enhances health," as defined by CDC [6]. "Physical activity levels are less than those required for optimal health and prevention of premature death."

Smoking

As smoking increases the rate of diabetes also increases for both men and women. Among those who are smoking 2 packs per day at baseline, men have a 45% higher diabetes rate than men who have never smoked; the comparable increase for women is 74%. Quitting smoking increases reduces the rate of diabetes to that of non smokers after 5 years in women and after 10 years mechanism in which smoking may increase a person's risk of developing type 2 diabetes [7].

Obesity

Obesity can be defined as the disease in which excess fat was accumulated in the body. According to the World Health Organization (WHO) obesity is the one that is the most neglected public health problem in both developed and developing countries(8) . In 2017, there were over 72 million cases of diabetes mellitus in India [9].

According to the World Health Organization, it is projected that by 2025 about 700 million adults are obese and the number of overweight and obesity in the world Age group of 41–60 years are the major risk of diabetes [10]. Obesity is a mostly independent and modifiable risk factor for T2DM.

Alcohol

Heavy alcohol causes insulin sensitivity to be reduced, while insulin secretion may be increased, resulting in hyperinsulinemia, especially in the early phase of the disease [11]. High concentrations of ethanol decreases fat oxidative capacity and elevated levels of circulating free fatty acid [12]. A reduced fat oxidative capacity and metabolic inflexibility are important components of muscle insulin resistance [13] may lead to reduced insulin binding [14] and inhibition of intracellular signaling related to that of insulin [15].

Comorbidity

It is usually defined as the co-existence of other conditions with an index condition (ie;the main condition under study) where these other conditions are not consequences of the index conditoComorbidities accelerate the progression of individual conditions, encourage the development of other physical and mental conditions and even lead to premature mortality [16].

Hypertension

Blood pressure is the force exerted by circulating blood against the walls of the arteries, the major blood vessels in the body. Hypertension is when blood pressure is too high [17]. Normal blood pressure is if systolic blood pressure is below 120mmhg and diastolic blood pressure is below 80mmhg.Pre hypertensive stage is when systolic blood pressure is between 120-139 mmHg and diastolic blood pressure is 90-99 mmHg [18]. The important factors for maintaining normal blood pressure are cardiac output and peripheral vascular resistance [19] than in women [20].

Gastritis

Gastritis is an acute or chronic inflammation of mucosal layers of the stomach. It may be caused due to excessive intake of alcohol, ingestion of irritating drugs, food poisoning and infectious diseases. Symptoms are severe vomiting, loss of appetite, thirst and diarrhea [21]. Acute gastritis also referred to as reactive gastritis occurs as a result of the trigger by factors such as NSAIDs, stress, bile reflux, radiation, alcohol abuse, cocaine addiction, and ischemic damage. As a result of the triggering agent and decreased prostaglandin synthesis is the reason for injury of gastric mucosa. Which acts as safeguard for the deleterious effects of the gastric acid by mechanisms [22]. In the majority of patients, the initial acute phase of gastritis is subclinical and is of short duration.

Chronic liver disease

Chronic liver disease refers to the disease of the liver which lasts over a period of six months. It consists of a wide range of liver pathologies including inflammation of liver, liver cirrhosis, carcinoma of liver. Jaundice, peripheral edema, bruising ascites is common symptoms of chronic liver disease. Causes of chronic liver disease are viral infections (hepatitis b, hepatitis c), chronic alcohol intake, use of certain hepatotoxic drugs like methotrexate, amiodarone, nitrofurantoin, paracetamol [23]. At their most advanced stage, CLDs often lead to the development of cirrhosis, defined as the irreversible distortion of the liver architecture by fibrosis, scar, and abnormal nodules [24] An estimated 1.5 billion persons have chronic liver disease worldwide. The age standardized incidence of chronic liver disease is 20 per 100,000 and cirrhosis is 13 per 100,000.

Depression

Depression is a mood disorder .It is described as feelings of sadness, loss, anger that interfere with person's everyday .Depression is common and serious medical illness that negatively affects the person's way of thinking(25) The Center for disease control and prevention estimates that 8.1 % American adults ages 20 and above had depression[The population based study from India to report on depression shows that prevalence of depression was 15.1%.India is home to an estimated 57 million people (18% of global estimates affected by depression).

CKD

Chronic kidney disease also called chronic renal failure is defined as gradual loss of kidney function. The main function of the kidney is to filter wastes and excess fluids from blood which is then excreted through urine. When CKD reaches an advanced stage dangerous levels of electrolytes, wastes and fluids accumulate in the body [26]. It is a non communicable disease usually caused by Diabetes and Hypertension [27].

Complications

Complications are most common among patients with type2 DM and are responsible for significant morbidity and mortality. Complications of diabetes are classified into two categories micro vascular and macro vascular in which former having higher prevalence than later [28].

Micro vascular complications include neuropathy, nephropathy and retinopathy while macro vascular complications include stroke, cardiovascular disease, peripheral artery disease. The adequate control of blood sugar levels, blood pressure and blood lipid levels can prevent (or) delay the complications in diabetic people [29].

Microvascular Complications

Diabetic Nephropathy

Diabetic nephropathy takes almost 20% to 40% of diabetic population [30]. Craig et al reported that almost 50% of Indians developed diabetic nephropathy after 20 years of onset of diabetes mellitus and 15% of them had reached end stage kidney disease(31) In a cross sectional study from Egypt, among diabetic population 42% had diabetic nephropathy [32]. In Jordan 33% of diabetic population at national diabetes centers had nephropathy [33]. And at a diabetic clinic in Libya, 25% of diabetes had diabetic nephropathy [34]. From recent studies it was evident that prevalence rates of diabetes related end stage kidney disease for patients aged 60-69 and >70 years were 410.3 and 475.5 respectively in whites and 1439.9, 1471.5 respectively in Africans [35] In India the diabetic population by 2007 is estimated to be 40.94 million which is expected to increase to 60.9 million by 2015(36) . In a study conducted in the south urban Indian population it is evident that diabetic population affected with nephropathy is 2.2% i,e >850,000 individuals(37) . In a study conducted in year 2020, out of 200 subjects, 26 were found to have diabetic nephropathy was higher when associated with risk factors like hypertension, obesity [38].

DIABETIC FOOT ULCERS

Diabetic foot ulcer is one of the most serious complications of diabetes. It is associated with major morbidity, mortality and reduced quality of life [39]. The incidence of diabetic foot ulcer is rising worldwide [40]. According to international consensus on diabetic foot, a full thickness wound below the ankle in a diabetic patient irrespective of duration is known as diabetic foot ulcer [41].

DIABETIC NEUROPATHY

Diabetic peripheral neuropathy is a microvascular complication of diabetes that increases morbidity and disability due to ulcerations and amputations(42) .It is an asymmetrical , sensorimotor and polyneuropathy that is caused due to metabolic and microvascular changes which are resulting from long term hyperglycemia and metabolic disorder(43) .Firstly, diabetic peripheral neuropathy leads to segmental demyelination , subsequently resulting in delayed nerve conduction velocity(44)

RETINOPATHY: Retinopathy is the leading cause of visual loss in adults and is the most common microvascular complication of Diabetes mellitus. Uncontrolled diabetes can lead to many ocular disorders, out of which diabetic retinopathy is common and severe ocular complication [45]. The incidence of Diabetes is increasing but that of Diabetic retinopathy is probably falling by the better management of glucose levels, lipid abnormalities and Hypertension [46]. Clinically Diabetic retinopathy is divided into two stages: non proliferative diabetic retinopathy (NPDR) and proliferative].diabetic retinopathy (PDR). NPDR is the early stage and PDR, a more advanced stage of DR [47]

MACROVASCULAR COMPLICATIONS

Cardiovascular disease:

T2DM is a pendant cardiovascular risk that is known to be the leading cause of morbidity and mortality associated with type 2 diabetes mellitus [48]. People with diabetes have a three to five time's higher risk for congestive heart disease than in non diabetic subjects [49]. The lifetime risk for patients in cardiovascular disease with diabetes is high i,e 67% in men and 57% in women at age 50 years [50] increase in the cardiovascular events takes place with increase in 1 mmol/1L of fasting plasma glucose. So this evidence indicates that risk of CVD begins in prediabetes and increases in people with diabetes and significantly more in women with diabetes [51]. Over the past three decades, the global burden of DM has increased from 30 million in 1985 to 382 million in 2014, and the rates of graphs have increased with time. According to the estimation of the International diabetes federation project, 592 million (1 in 10 persons) worldwide will have DM by 2035.

Diabetic Ketoacidosis

Diabetic ketoacidosis is characterized by uncontrollable hyperglycemia, metabolic acidosis, and increased body ketone concentration [52]. DKA is a state of relative or absolute insulin deficiency that is worsened by hyperglycemia, dehydration and acidosis. It occurs when absolute or relative insulin deficiency inhibits the ability of glucose to enter cells for utilization as metabolic fuel, the result being that it rapidly breaks down into ketones to employ as a fuel source [53].

Diabetic ketoacidosis is a major acute metabolic complication of type 1 diabetes [54] Higher prevalence of DKA is observed among women than in men. Incidence is higher among patients using injectable injections compared to the subcutaneous insulin infusion pumps.

Methodology

Study site:

This study was conducted at the general medicine in a Tertiary Care Teaching Hospital, Ongole, Prakasam dist, Andhra Pradesh, India.

Study approval: This study was approved by the institutional ethical committee of the QIS College of pharmacy.

Study design: This was a prospective observational study carried out in General Medicine. This study took place over a six-month period, from November 2020 to April 2021.

Study population: A total of 800 people were surveyed for this study.

Inclusion criteria: Diabetic patients > 18 years to <80 years are included.

Exclusion criteria: Diabetic patients < 18 years to > 80 years are excluded. Patients with type 1 diabetes mellitus and gestational diabetes are excluded.

Study Procedure

✓ Prospective observational studies that have been conducted on 800 patients in General medicine of a tertiary care hospital among the patients who adhere to criteria were registered in the study. The data was collected by using well designed Proforma according to the criteria; the data was analyzed by SPSS software version 25.

Results

AGE

Age is one of the primary risk factors in Diabetes mellitus. Of the 800 patients, the majority of patients are 262(32.7%) between 50-59, 180 (23.6%) between 40-49, 177(22.1%) between 60-69, 109 (13.6%) between 70-79 and 63 (7.8%) between 30-39.

BMI

Of the 800 patients, 398 patients (49.75%) are overweight, 204 patients (25.5%) are obese, 190 patients (23.75%) are normal and 8 patients (1%) are underweight.

GENDER

492 (61.5%) are male and 308 (38.5%) are female.

OBESITY: 596 patients (74.5%) are non- obese and 204 patients (25.5%) are obese.

Alcoholic

Of the 800 patients, 532 patients (66%) are alcoholic and 267 patients (34%) are non alcoholic.

SMOKING: Of all the 800 responses, 557 patients (69.62%) are smokers and 239 (30.37%) are non smokers.

Duration of Diabetes Related To Their Complications

Table: 1

VARIABLES	Nephropathy	CVD	CVA	Diabetic foot ulcer	Ketoacidosis	Retinopathy	Neuropathy
<5 years	1.2%	4.7%	5%	2.3%	1.5%	0%	3.2%
6 – 10 years	8%	14.2%	13.5%	8.4%	4.2%	9.5%	7.8%
11–15 years	20.8%	35%	30%	20%	10%	21%	23%
16-20 years	41.3%	60 %	55%	35%	25%	45%	6.2%
>20 years	58.8%	76.%5	69.1%	45.5%	29.4%	66.2%	58.8%

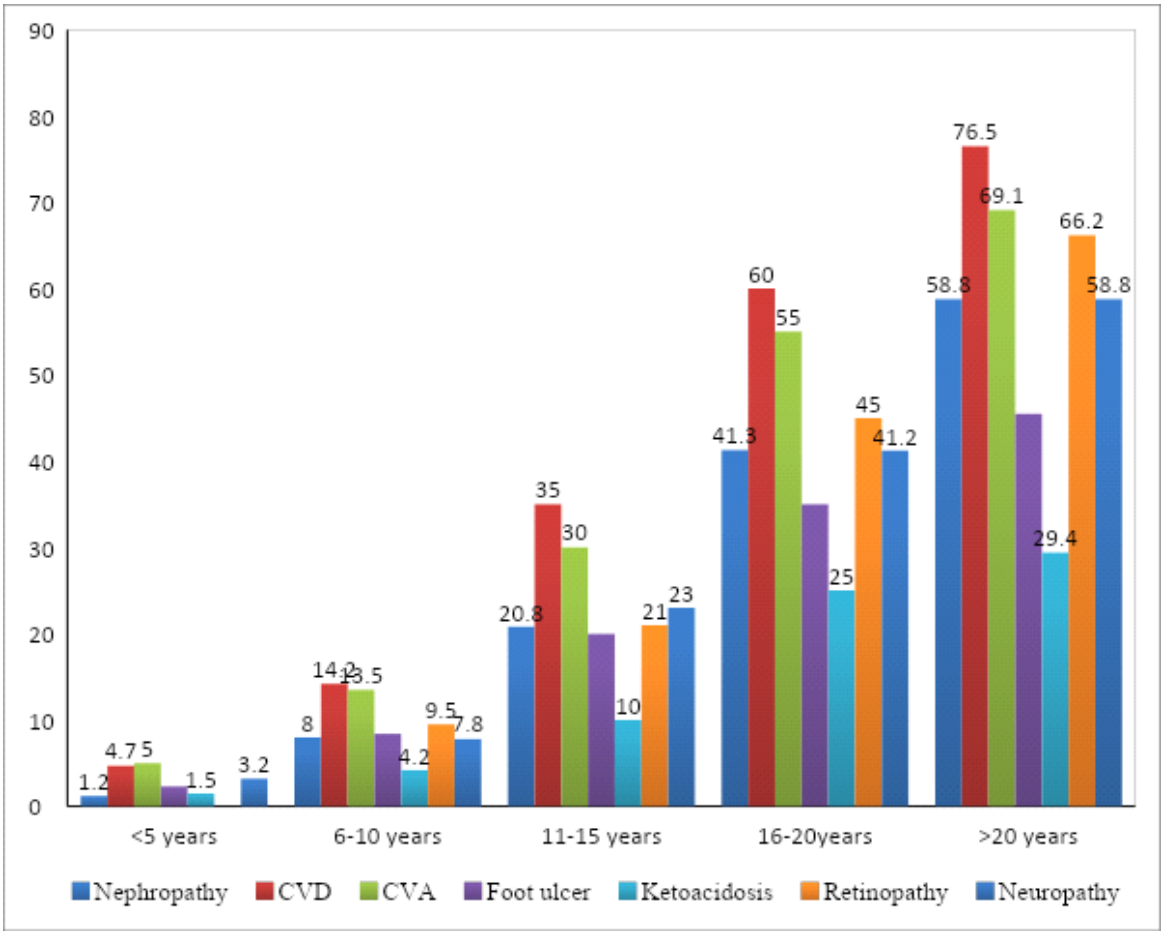


Table: 2 Various types of Complications associated with Type 2 Diabetes.

Variable	Frequency	Percentages
Complications		
CVD	185	23.10%
CVA	169	21.10%
Neuropathy	126	15.70%
Retinopathy	123	15.30%
Nephropathy	113	14.10%
Diabetic foot ulcer	107	13.30%
Ketoacidosis	63	7.80%

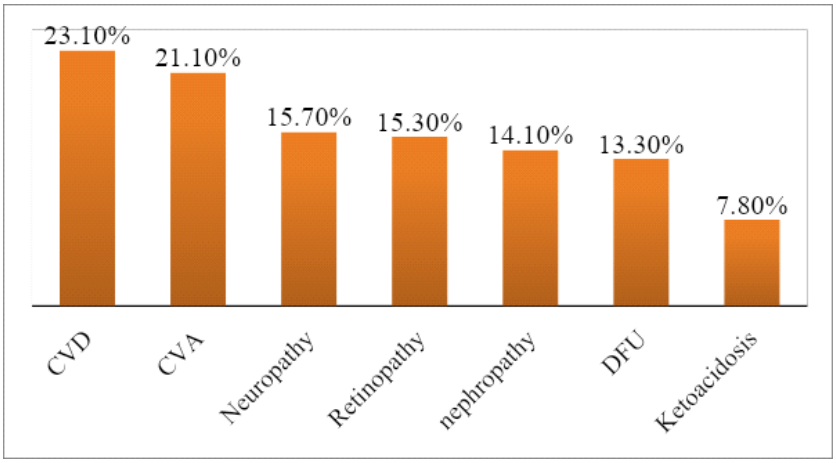
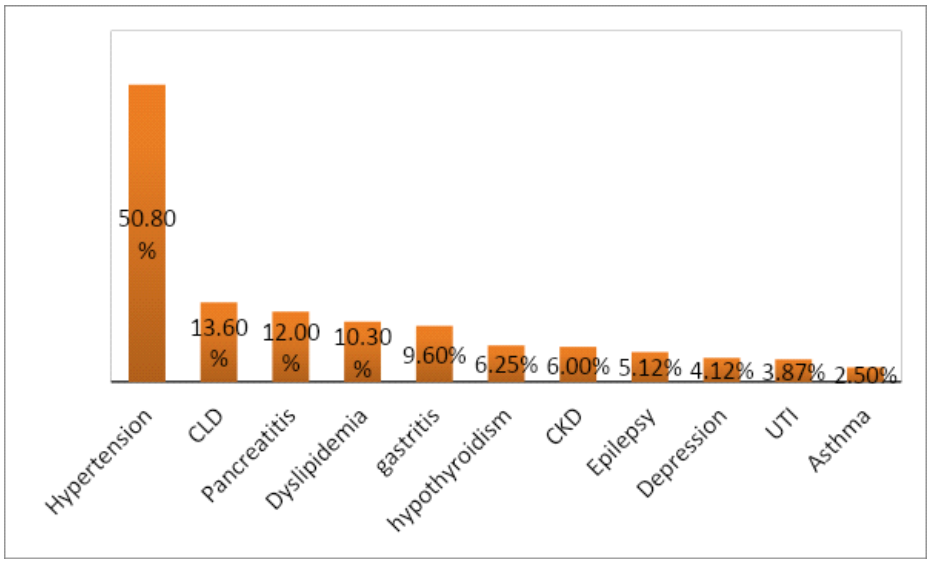


Table :3 Comorbidites associated with Type 2 Diabetes

Variables	frequency	percentages
Co morbidities		
Hypertension	407	50.80%
CLD	109	13.60%
Pancreatitis	96	12.0%
Dyslipidemia	83	10.30%
Gastritis	77	9.60%
Hypothyroidism	50	6.25%
CKD	48	6.0%
Epilepsy	41	5.12%
Depression	33	4.12%
UTI	31	3.87%
Asthma	20	2.50%



Conclusion

This study mainly focused in patients having duration of diabetes less than 5 years having complications of 0.8% patients with nephropathy, 2.1% patients with CVD, 1.8% with CVA, 1.2% with diabetic foot ulcer, 0.6% with ketoacidosis, 0.3% with retinopathy, 1% with neuropathy. Between 6-10 years of disease duration there are 2.5% with nephropathy, 3.3% with CVD, 3% with CVA, 2.2% with diabetic foot ulcer, 0.9% with ketoacidosis, 1.8% with retinopathy and 1.3% with neuropathy. In between 11-15 years duration with diabetes there are 3.8%,5%,4.4%, 2.9%, 1.5%, 3.2% and 3.5% with nephropathy, CVD,CVA, diabetic foot ulcer, ketoacidosis, retinopathy, and neuropathy respectively. As the duration of diabetes increases the occurrence of compliacations is also rises and leads to death.

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Conflict of Interest

Authors are declared that no Conflict of Interest

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