INTRODUCTION
LOCATION MAP OF NORTH MALABAR

Figure-1

Figure-2

KASARGOD
KANNUR
WAYANAD

INDIAN OCEAN

ARABIAN SEA

BAY OF BENGAL

INDEIA
Diabetes mellitus is the most common metabolic and endocrine disease of mankind. The two broad categories of diabetes mellitus are designated as type 1 and type 2. Type 1 (T1DM) is the result of near total absence of insulin, whereas Type 2 diabetes mellitus (T2DM) is a heterogeneous group of disorder characterized by insulin resistance, impaired insulin secretion, and increased glucose production. Type 2 diabetes mellitus is the commonest form of diabetes affecting more than 90% of the population worldwide. There is a rapid upsurge in the number of diabetic patients, and this explosive growth is noted in both urban and rural areas. Sara Wild et al in their estimate for the year 2000, and projections for the year 2030, predicted that the number of Type 2 diabetes patients will increase to 366 million from 174 million. India, China, United States, Indonesia, and Japan are the five most affected countries in the world with largest number of diabetes mellitus patients. In 2005, the Centre for Disease Control (CDC) estimated that the prevalence of diabetes mellitus in US was 13.3%, in African Americans, 9.5% in Latinos, and 15.1% in American Indians. Nearly 20.8 million Americans have diabetes and a million new diabetes cases are diagnosed yearly in US. The prevalence was 2-3% in UK, but is higher in the Middle East and Far East. A rapid rise in Type 2 diabetes was noticed in the Asians and Afro Caribbean immigrants to the UK. A two times higher prevalence of diabetes was noticed in China when compared to the 3.1% in 1994. In the Indian subcontinent the prevalence increased to 12% from 2.3% in 1975. Zimmet and Alberti observed in their article in Lancet (1997) that Diabetes mellitus involves huge personal and socio-economic cost, and is now being recognized as a major health issue in most countries. Improved nutrition, better hygiene, and intercontinental acculturation, newer amenities in work place, and recreations have improved the living standard all over the world. The infection and other disease associated with poor hygiene and sanitation markedly decreased and this reduced mortality and increased life span. Orman termed this as epidemiological transition. Decoutren et.al, attributed the explosive growth in diabetes patients to increased life span and
ageing population\textsuperscript{5} whereas Ziv and Shafrir attributed this to the increased prevalence of obesity and coined the term diabesity.\textsuperscript{6}

India is the epicenter of this emerging diabetic epidemic. Our country has the largest number of diabetic patients in the world, which was estimated as 40.9 million in the year 2007, and is expected to increase to 69.9 million by the year 2025.\textsuperscript{7} Ramachandran et al. from Chennai estimated 14.7\% of urban and 2.4\% of rural population to be diabetic.\textsuperscript{8} A number of studies from India reported a rising prevalence of type 2 diabetes mellitus. Kodali et.al reported that the prevalence in the urban centre in New Delhi was 2.3\% in 1972\textsuperscript{9}, whereas it increased to 6.7\% in 1997, and to 10.3\% in 2001 and 13.5\% in 2007. It was shown by several authors that Indian population faces the highest risk for development of diabetes and its complications.\textsuperscript{10} Extensive literature review and search showed that we had only limited studies focusing exclusively on the rural population, and most of the cited studies were prevalence studies on diabetes. Raheja and Kapur pointed that the studies on the profile and risk of Type 2 diabetes patients are very few from India.\textsuperscript{11} The notable urban studies from India are National collaboration studies on prevalence of diabetes mellitus by Ahuja from New Delhi,\textsuperscript{12} the rising prevalence of Non Insulin Dependent Diabetes Mellitus (NIDDM) in the urban population by Ramachandran et al.\textsuperscript{13}

In the year 2008, the WHO-ICMR Indian NCD risk factor surveillance showed that in the urban area, the prevalence of diabetes is 7.3\% and in rural area it is 3.1\%.\textsuperscript{14} The notable prevalence studies from the rural area are by Rao et.al from Eluru,\textsuperscript{15} Prevalence Of Diabetes mellitus India Study (PODIS)\textsuperscript{16} by Indian Task Force. The other important study from India, the National Urban Diabetic Survey (NUDS) published in the year 2001 also showed a rising prevalence of diabetes in India and the Diabetic epidemiological Study of India (DESI) which again reported high prevalence of diabetes in India.\textsuperscript{10} Ramachandran et al attributed a low threshold for Asians to develop diabetes mellitus.\textsuperscript{17}
The scenario in Kerala is not different from other parts of the world. In Kerala also there has been a rapid increase in the number of type 2 diabetes mellitus patients in the last two decades. The Amritha Diabetes Endocrine Population Study (ADEPS) from Ernakulam district in Kerala revealed a 16.2% prevalence of type 2 diabetes and 20.8% of impaired glucose tolerance (IGT) among Keralites. ADEPS reported obesity, age, and acanthosis nigricans risk factor in their study. Narendran et al from Palakkad reported a prevalence of 26% cases of diabetic retinopathy among keralites with type 2 diabetes mellitus. The cardiovascular mortality is highest in Kerala and one important feature of this epidemic is that more young people are affected in the state, when compared to the rest of the country. Menon and Kumar studied the prevalence of diabetes and associated risk factors of type 2 diabetes from central Kerala and noticed an increasing prevalence. Kutty VR, Soman CR of Health Action Plan Kerala also studied epidemiological aspect of diabetes and noticed close association of diabetes and coronary artery disease in the Thiruvananthapuram city. KP Poulose studied the profile and association of type 2 diabetes patients in more than 8000 patients and noted that more than 50% had a family history of type 2 diabetes mellitus. Joseph A et al, noticed that increased serum lipids and diabetes are risk factors for cardiovascular disease in the state. Arunachalam and Guneshekharan in the year 2002 reviewed the indexed studies from India, and came across 837 unique papers and 667 articles from India. He pointed out that 62 of the very often quoted studies are from Chennai. The CUPS study from Chennai is one of the most important studies from an urban centre in India which dealt in detail the epidemiology and profile of diabetic patients from Tamil Nadu. Study by GS Sridhar also highlighted the important risk factors like family history, sedentary life styles among North Indian population. Kowaikar from central India also reported diabetes was more among males, and sedentary habits, alcohol consumption and obesity are risk factors of type 2 diabetes in central India. The other major risk factor study on type 2 diabetes from India by Dudeja et al from the North India found that Body Mass Index (BMI) does not accurately predict overweight among Asian Indians.
As noted earlier there is an unprecedented epidemic of diabetes occurring in both urban and rural areas. But the exact cause of this trend is not known. Diabetes mellitus causes increased morbidity and mortality. Many factors like increased longevity, obesity, dietary factors, sedentary life style, were implicated in the development of diabetes mellitus. Heimrich who studied the relation of physical activity and diabetes showed that physical activity has a beneficial role. Rimm and Chan studied the relation of smoking and alcohol intake in the development of diabetes found that both are risk factors for the development of diabetes. Mooy et al noticed that major stressful events in life can lead to Type 2 diabetes mellitus.

But the exact risk factors for the development of type 2 diabetes mellitus remain elusive. The true extension and dimension of the diabetes epidemic in India, and its impact in the management of diabetic patient in our country is yet to be ascertained. Over the past half a century, there has been tremendous progress in the clinical work and research methodology. Still the research studies on diabetes from Kerala are very few compared to other south Indian states.

**Scope and significance of this study**

Seventy percent of the Indian population lives in the rural area. It is a well known fact that urban and rural population have different life styles, work patterns, environmental and socio cultural factors. It is well known fact that the presentation of type 2 diabetes mellitus is not uniform throughout the world, and there are geographical and ethnic variations, and the prevalence and profile of diabetic patients are different among the population of the same nation. Major studies from the western countries and urban studies from India attributed changing life style, sedentary habit and diet and related epidemiological transition as the major factors in the development of diabetes mellitus. But how far is it applicable to a rural population who still subsist on traditional life style in the Northern part of Kerala? What is the scientific and statistical backing for the observations made on the risk factors of type 2 diabetes in this region? The risk factor hitherto attributed in the development of type 2 diabetes mellitus.
in the western and urban population cannot be fully applied in a rural set up. So when there is a rapid upsurge of type 2 diabetes mellitus in both urban and rural area, it is imperative to find out the factors predisposing to the development of the disease, which has already affected one out of five Indians, and to highlight the differences and similarities with urban and western studies. There are only limited studies on the subject from India; of them the most well acclaimed studies are from Chennai and other metropolitan cities from India. Most of the studies from India are prevalence studies on diabetes mellitus and only a very few studies have focused on the profile and risk factors of type 2 diabetes mellitus. The North Malabar areas include Kannur, Kasargod and Wayanad district of Kerala state, and this part of state is an ideal geographic area to undertake such a study, because most of the populations in this area have a traditional rural life style. So this study was undertaken to identify the risk factors of type 2 diabetes mellitus among rural population of north Kerala, and to give a statistical power to the conclusions. The influence of age, gender, occupation, physical activity, obesity, family history, diet, stress, smoking, hypertension were included in this study to know its association with development of diabetes. This study being the first doctoral thesis from the Faculty of Medicine from Kannur University, will stimulate further research on the subject, and will be a bench mark for the future studies. The conclusions and finding will help to formulate preventive measures and strategies to combat disease at the regional level with the input and resources available locally.