Introduction
I INTRODUCTION

Good nutrition is a major resource and an important dimension of the quality of life. But in present times, changes in socio economic scenario, dietary pattern, life style, technological changes stemming from rapid modernization altered life and health expectancy and the way of living in people has favored an increase in the occurrence of non-communicable yet chronic and degenerative diet related diseases.

Chronic diseases are now a serious global health problem. According to the world health organization (WHO), chronic diseases are the largest cause of death in the world, led by cardio vascular disease (17 million deaths, mainly from ischemic heart disease and stroke) and followed by cancer (7 million deaths), chronic lung disease (4 million), and diabetes mellitus (almost 1 million). The global prevalence of the leading chronic disease is projected to increase substantially over the next two decades. For example, the number of individuals with diabetes is estimated to rise from 171 million (2.8% of the worlds population) in 2000 to 366 million (6.5%) in 2030, 298 million of whom will live in developing countries (Corinna et al., 2007).

Diabetes mellitus is the most common metabolic disorder affecting humankind. Though the disease is known from ancient times, and several break through have been made, including the discovery of Insulin in 1921, neither the etiology is clearly understood nor the cure has been found. Modern medicines manage to control hyperglycemia, which is the hallmark of the disease and thereby provides relief from symptoms and prevents or delays the complication (Bamji et al., 2004). But modern medicines are most costly and diabetes mellitus is burdensome chronic disease of our time and a condition that is increasing in epidemic proportion worldwide.

Diabetes mellitus is characterized by lack of insulin in the blood, which leads to abnormalities in the assimilation of carbohydrates by the body informed (Bhatnagar, 2005). Diabetes mellitus affects 200 million people worldwide. International Diabetes Federation (IDF) estimated that this figure will increase to 333 million by 2025 (Prasad, 2006).

As per the statement given by (Seedat et al., 2000) the incidence of diabetes increased at an alarming rate in India, today. The recent projections from WHO pointed
out, that India has nearly 30 million diabetic subjects, which is 15 per cent of the total diabetics worldwide (Knowler et al., 2002). According to Neelam (2005) around 150 million people suffer from diabetes in the world, out of which above 35 million are Indians, the highest number in any country. Every 5th person who suffers from diabetes in the world today is an Indian. Seven million people develop diabetes every year; over three million deaths are directly due to diabetes. Every 10 seconds a person dies from diabetes related causes. Diabetes is the fourth leading cause of death by disease globally (Duggriala, 2004). Recent epidemiological data showed that the prevalence of diabetes in India is 8-10 per cent (WHO, 2002).

Pradeepa et al., (2002) stressed that India ranks as the Diabetes capital of the world, with an estimated population of 80 million people with diabetes by the year 2030. Its complications are a significant cause of morbidity and mortality. The World Health Organization (WHO, 2002) predicted that by 2025 atleast 74 million Indians will have diabetes. King (2001) expected that by the year 2025, India is likely to have 57 million diabetics, the largest in the entire world. There is an alarming upward trend in recent years in diabetes mellitus. In South India, the prevalence of diabetes above the age of 20 is 8.2 per cent in urban population and 4.4 per cent in rural population (Saroja, 2004).

Viswanathan et al., (2002) pointed out that more than three million deaths are attributed to diabetes every year around the world and the dramatic rise in diabetes prevalence is found high in developing countries. Almost 3.2 million people die of diabetes across the world every year says (Mathur et al., 2005). It is estimated that total direct healthcare expenditure on diabetes worldwide is between 213 billion and 396 billion international dollars in 2025 and it means that the proportion of the world's health care budget spent on diabetes care in 2025 will be between 7 per cent and 13 per cent.

World Health Organization study group on Diabetes Mellitus has recognized two types of diabetes namely Insulin Dependent Diabetes Mellitus (IDDM) and Non Insulin Dependent Diabetes Mellitus (NIDDM). In the recent past, the term Insulin dependent diabetes mellitus (IDDM) has been replaced by Type I diabetic. Type I diabetic patients have β cell destruction, which is usually immune mediated the majority of the patient develop absolute insulin deficiency and are ketosis prone. The term non insulin dependent diabetes mellitus (NIDDM) has been replaced by Type II diabetic which encompasses the most prevalent form of disease. Most patients with type II diabetes
mellitus exhibit insulin resistance (IR) and ultimately develop concomitant insulin secretary defect (Shaw et al., 2004).

Type I diabetes mellitus results from a severe absolute lack of insulin caused by reduction in β cell mass. The three interlocking mechanisms responsible for the islet cell destruction are genetic susceptibility and acute autoimmunity (Arulmozhi et al., 2004). Type II diabetes mellitus identifies patients who do not require insulin treatment to maintain the health status. The two metabolic defects characterizing type 2 diabetes mellitus are one, derangement of insulin secretion that is delayed or is insufficient relative to glucose load and two, inability of peripheral tissues to respond to insulin called insulin resistance (Shaw et al., 2004).

Insulin resistance is a multifaceted syndrome responsible for the future development of type 2 diabetes, obesity, hypertension, dyslipidemia and atherosclerotic cardiovascular diseases (Kumar et al., 2005). Insulin resistance present in patients with impaired glucose tolerance and hyperinsulinemia are the two major biochemical manifestations. The factors that contribute to insulin resistance are age, high fat diet, decreased physical activity, increased visceral fat accumulation, smoking and hyperglycemia (Nesto et al., 2003).

Environmental factors such as diet, lifestyle, obesity and sedentary activities increase the risk for diabetes, since all these factors are interrelated, the role of each factor can not be assessed in isolation. Previously the genetic factors were considered as the major factor for diabetes. But recent research depicts that life style modification, stress, faulty food habits and obesity especially android obesity are the major causes for the occurrence of diabetes mellitus. Stress and dietary habits play a major role in precipitating diabetes (Ramachandran, 2006).

In the forecoming days, diabetes mellitus is presumed to increase, day by day due to an increase in factors contributing to hyperglycemia, which include dietetic irregularities, metabolic dysfunction, lack of exercise, stress and busy lifestyle (Wyshak, 2002).

Gulanick and Lamendola(2002) stated that diabetes mellitus is considered as one of the leading causes of morbidity and mortality, since it causes secondary pathophysiologic changes in the multiple organ system. Neelam (2005) viewed diabetes
accompanied a cluster of life threatening complications and affects various organs like heart, eyes, even brain and kidney by having deleterious effects. Thereby, it reduces life expectancy by 5-7 years, it increases the risk of heart diseases by 50 times, renal problems by 17 times and gangrene by 25 times. Diabetes mellitus is characterized by thirst, polyuria, blurring of vision and weight loss (Hatapakki et al., 2005).

Corinna et al., (2007) stated that one of the leading risk factors for chronic diseases is diet. The scientific evidence shows that diets high in fats, especially saturated fat and trans-fatty acids, free sugars, and salt and low in fruits, vegetables, pulses (legumes), whole grains and nuts pose significant risks for chronic diseases.

Food based approaches are the most substantial and cost effective in maintaining health status. To reduce the burden of this disorder and its complications, normal homeostasis remains a major goal. The goal should be to keep blood glucose as close as possible to that of a person without diabetes. Proper dietary modification, medicinal therapy, physical activity and medication along with self monitoring of blood glucose form the cornerstone of diabetes management (Sudha, 2004).

It is also important to realize that lifestyle pattern and environmental factors, in addition to nutrition influence health and well being, but nutrition is a major, modifiable and powerful factor in promoting health, preventing and treating disease and also improving quality of life (Josling, 2001).

Esser (2000) opined that food provides not only essential nutrients needed for life but also other bioactive compounds for promotion of health and prevention of disease. Previous epidemiologic studies consistently shown that diet plays a crucial role in the prevention of chronic diseases. Quality and quantity consumption of foods especially grains, fruits and vegetables are strongly associated with reduced risk of diabetes, cardiovascular diseases, cancer, cataracts etc. Townsend and Roth (2000) suggested that the risk should be reduced by including proper dietary supplements of protective foods which contain significant amounts of bioactive phytochemicals. These are essential to have desirable health benefits beyond basic nutrition to reduce the risk of chronic disease.
The Dietary Supplement Health and Education Act (DSHEA) defines "A dietary supplement is a product that is intended to supplement the diet and that bearing or containing one or more of vitamins, minerals, herbs and amino acid. A dietary substance used by man to supplement the diet by increasing the daily intake, or a concentrate, metabolite, constituent, extract or combinations of these nutrients (Jenkins, 2004)."

The ancient literature in India and Indian system of medicine are based on foods, spices and herbs. Ancient physicians and healers used natural bio-remedies to treat and control diseases. Until recently, modern man neglected the medicine in our everyday food but now medical and other allied sciences traced back the steps to food based approaches for controlling the diseases, which are currently increasing, more so in developing countries. These foods are valuable for its micronutrients related functions and also its bioactive phytochemical prevention, degenerative processes by antioxidant, antimitagenic, anticarcinogenic, anti inflammatory, anti atherogenic, anti thrombogenic etc. On the science based evidence, it is advisable to produce, prescribe, process and promote plant foods especially protective foods for their valuable vitamins, minerals and phytochemicals (Sureshbabu et al., 2006).

Diabetes mellitus, the silent killer disease can be postponed and can totally be prevented even in high risk people. "Prevention is always better than cure". Most of the health problems are prevented through changes in human behavior and a change in attitude of people of their diet (Seshiah, 2005).

The earlier dietary studies recommended the calorie restricted diet for the treatment of diabetes. But in later stages, diets higher in complex carbohydrate, dietary fibre and relatively low in fat have more beneficial effects on diabetic individuals and also proved that a high carbohydrate and high fibre diet along with small doses of oral hypoglycemic agents was suggested by Professor Viswanathan and his colleagues to control diabetes (Sudha, 2004).

Mohan et al., (2003) feel that though people are aware of diabetes, they are unaware of healthy dietary habits and the major complications of retinopathy, neuropathy and nephropathy which occur over time in uncontrolled conditions. Nutrition and health education help to control these complications and the consequences.
Among the various dietary components dietary fiber becomes an important aspect of concern today because of its role in controlling chronic disorders like diverticuli bowel cancer, cardiovascular diseases, diabetes, constipation, kidney disease, gout and obesity etc (Evan, 2000). High dietary fibre, especially soluble fibre, but low fat (especially saturated fat), and low sugar diet is encouraged for people who suffer from diabetes mellitus and also a reduction in their intake of carbohydrates that have a high glycaemic index and to control diabetes mellitus (Neeraja and Rajyalakshmi, 2003).

Several studies revealed that there is lack of knowledge on diet control, exercise, education, foot care etc, among the diabetic persons. For the effective management or prevention of non-communicable diseases which exhibit a higher morbidity and mortality pattern, nutrition education is also the need of the hour (Ken, 2000). Preventive nutrition and health education regarding diabetes can be given for those who are yet to become diabetic. Education to non diabetic adults can also be given. Habits and life style modifications should be started well in the childhood years or the formative years. Adult population who are yet to develop diabetes can be counseled regarding the ways and means to prevent the onset of diabetes (Khan and Safti, 2003).

It is recommend by Townsend and Roth (2000) hat people with diabetes should work with their diabetes management team (Registered Dietitian, Nurse, Physicians needed) to develop a nutritional plan for their lifestyle requirements. Apart from the diet, nutrition and health education, well known accepted traditional practices and traditional diets, including foods, spices and herbs appear to be playing a prominent role in the prevention of several chronic diseases (Renu et al., 2005).

Different types of oral hypoglycaemic drugs such as biguanides and sulphonylurea are available along with insulin for the treatment of diabetes mellitus, but have side effects associated with their uses. There is growing interest in herbal remedies because of their effectiveness, minimal side effects in clinical experience and relatively low costs. Herbal drugs or their extracts are prescribed widely, even when their biological active compounds are unknown. Even the World Health Organization approves the use of plant drugs for different diseases, including diabetes mellitus, therefore studies with plant extracts are useful to know their efficacy and mechanism of action and safety (Gupta et al., 2005).
Many herbal agents including metals and minerals are prescribed for treatment of diabetes mellitus in ancient literature (Vinuthan et al., 2004). Ghosh et al., (2004) indicated that herbal preparations alone or in combination with oral hypoglycaemic agents produce an effective therapeutic response in some resistant cases where modern medicines alone fail.

Though synthetic drugs are commonly used in the present day with the advancement in chemical technology, awareness about its side effects is slowly triggering the use of non synthetic curatives such as herbs. Recently, considerable attention has been paid to utilize herbs, eco-friendly and bio friendly plant based products for the prevention and cure of different human diseases. These medicinal herbs and plants are moving from fringe to main stream use with a greater number of people seeking remedies and health approaches free from side effects caused by synthetic chemicals (Johnson and William, 2002).

India is endowed with a rich wealth of more than 2000 medicinal plant species for thousands of years and is termed as the Botanical Garden of the World. Example, the Caraka Samhita mentions the use of approximately 300 plants and their detailed medicinal uses. Today over 7500 different species of plants are used for various medicinal preparations across the country (Samhita, 2004) and these plants have made a good contribution to the development of ancient Indian materia medica. The curative properties of herbs are due to the presence of complex chemical substances of varied composition (secondary plant metabolites) in one or more parts of the plants. According to their composition, these plant metabolites are grouped as alkaloids, glycosides, carticosteriods, essential oil, etc., (Sonkamble et al., 2005).

Dahanukar et al., (2000) revealed that herbs are used in many domains including medicine, nutrition, flavoring, beverages, dyeing, repellents, fragrances, cosmetics, smoking, and other industrial purposes. This movement is based on the belief that the plants have a vast potential for their use as a curative medicine. The preservative effect of many plant species and herbs suggests the presence of antioxidative and antimicrobial constituents in their tissues. Herbal medicine is based upon the premise that plants contain natural substance that can promote health and alleviate illness (Mitra, 2002). It also contains a wide variety of antioxidants phytochemicals or bioactive molecules which neutralize the free radicals and thus retard the progress of many
chronic diseases associated with oxidative stress. The intake of natural antioxidants associated with reduced risk of cancer, cardiovascular diseases, diabetes and diseases associated with aging (Ahmed et al., 2006).

Naik (2005) expressed that the traditional medicines play an important role in the solving health problems and is invaluable on a global level. In herbal medicine, plant extracts are used to treat disease and promote wellbeing now a days. The active therapeutic principles of many plants are identified and pharmaceutical companies synthesized and patented new drugs to use in orthodox medicine. There are herbal preparations to promote the health of the immune, nervous, circulatory, digestive, skeletal, muscular and hormonal systems. But such a system of medicine is practiced in restricted areas because of ethnic reasons, lack of scientific validation, lack of proper documentation of therapeutic efficacy etc. (Chaudhary et al., 2003).

Herbal drugs have gained importance in recent years because of their efficacy and the cost effectiveness (Subramaniam, 2001). Knowing the nutritional significance and health benefits herbs Complementary and Alternative Medicine (CAM), including herbal medicine, have promoted rapid increase in the consumption of herbal remedies worldwide as they are safe and effective (Saad et al., 2005).

According to Ayurvedic texts, quoted by Annapurna et al., (2001) a combination of substances is used to get the enhanced derived action and eliminated unwanted side effects. These ingredients may aid absorption of active principles responsible for hypoglycaemic and protective action on organs

Mridula et al., (2005) mentioned that inspite of allopathic capsules cure being available, the last few years have seen a growing revival of interest in natural cures and home remedies. The undesirable side effects of certain drugs have unnerved the patients. Furthermore, population living below the poverty line is not able to afford exorbitant cost of drugs and thus rely on herbal medicines.

Corinna et al., (2007) stated that people in rural areas use various types of plants in trational medicine. In spite of increasing urbanization, an estimated 80% of the worlds population, mostly from developing countries, depends on traditional medicine for primary health care further more an estimated 25% of all prescribed medicines contain one or more ingredients derived from plants.
Ayurveda which uses only herbal medicine aims at having a healthy and happy society free from diseases. Two most important aims of ayurveda are to maintain the health of people and to cure the diseases of sick people (Joseph et al., 2005). Herbal medicine usage is increasing at healthy rate. Hence these valuable dietary assets should be included in our daily diet, incorporating with staple foods of low cost, locally available, fiber rich millets. These millets are available for effective control of diabetes, the percentage of public using these millets is low when compared to rice and wheat. So it was thought that it would be worthwhile considering a supplementation study with millet and pulse in combination with herbs.

Anon (2005) anticipated that the use of herbs was a time honored approach to strengthen the body and treating diseases as herbs contain active substances that do not have any side effects and can be had in combination with other herbs, supplements or medications. Hence the study “Management of Diabetes Mellitus (Type II) with herbal supplements” was framed and carried out with the following objectives to

- elicit information of the socio economic background, dietary pattern and lifestyle pattern of the selected diabetic subjects
- supplement their diets with fibre rich millet, legume and herbal powders and
- evaluate the effect of supplementation of the selected herbal powder on the diabetic subjects with special reference to anthropometric measurements and biochemical profile.

It is hoped that this study will bring to lime light the effect of selected herbal powder on diabetics by scientific validation and by proving its therapeutic efficacy. This may help the diabetic patients to control their metabolic disorder without any side effect.