1.1. Definition of Diabetes Mellitus

Diabetes Mellitus is a syndrome characterized by chronic hyperglycaemia with disturbances of carbohydrate, fat and protein metabolism resulting from defects in insulin secretion, insulin action or both. When fully expressed, diabetes is characterized by fasting hyperglycaemia, but the disease can also be recognized during less overt stages, most usually by the presence of glucose intolerance (Peter H, et al., 2005). The effects of diabetes include long-term damage, dysfunction, and failure of various organs, especially the eyes, kidneys, heart, and blood vessels. Diabetes may present with characteristic symptoms such as thirst, polyuria, blurring of vision, weight loss, and polyphagia, and in its most severe forms, with ketoacidosis or nonketotic hyperosmolarity, which, in the absence of effective treatment, leads to stupor, coma, and death. Often symptoms are not severe or may even be absent. Hyperglycaemia sufficient to cause pathologic functional changes may quite often be present for a long time before the diagnosis is made. Consequently, diabetes is often discovered because of abnormal results from a routine blood or urine glucose test or because of the presence of a complication. In some instances, diabetes may be apparent only intermittently, as for example, with glucose intolerance in pregnancy or gestational diabetes mellitus, which may remit after parturition. In some individuals, the likelihood of developing diabetes may be recognized even before any abnormalities of glucose intolerance are apparent. During the evolution of type 1 diabetes, for example, immunologic disturbances such as islet cell or other antibodies are present, and these may precede clinically apparent disease by months or even years. In some families it is possible to recognize certain gene mutations that are strongly associated with certain forms of diabetes, such as variations in the glucokinase gene or hepatic nuclear factor genes that cause youth or early adult-onset diabetes. These genetic abnormalities are detectable at any time.

Although a number of specific causes of diabetes mellitus have been identified, the etiology and pathogenesis of the more common types are less clearly understood. The majority of cases of diabetes fall into two broad etiopathogenetic categories, now called
type 1 and type 2 diabetes, but the extent of heterogeneity among these types remains uncertain. Because of the increasing number of forms of diabetes for which a specific etiology can be recognized, the current clinical classification, proposed by the American Diabetes association (ADA) in 1997 and adopted by the world Health organization (WHO) in 1999 and that supercedes the previously internationally recognized 1985 WHO classification, now classifies diabetes according to both clinical stages and etiologic types into: Type 1, Type 2, Gestational diabetes and Other specific types.

1.2. Worldwide prevalence of diabetes mellitus

Diabetes Mellitus is a major and growing health problem in most countries and an important cause of prolonged ill health and early death (WHO 2000, Wild S, et al., 2000). It was the sixteenth leading cause of global mortality in 1990, accounting for 571,000 deaths (Murray CJL and Lopez AD, 1997). Diabetes was predicted to continue to grow worldwide at epidemic proportions in the first quarter of 21st century. The growth was expected to be particularly strong in India and China, which lead the world in the prevalence of diabetes mellitus with 14.3% and 11.8% of prevalence, respectively in 1995 (King H, et al., 1998; Roglie G and King H, 2000). In USA, which ranks 3rd after India and China in the prevalence of diabetes, the growth rate is expected to be much smaller, from 13.9 million in 1995 to 21.9 million in 2025. Two cross-sectional studies in an urban south Indian population showed that the prevalence in persons older than age 20 years had increased from 8.3% in 1989 to 11.6% in 1995 (Zimmet P and Shaw J, 2005). In Denmark, a 38% increase in prevalence has been reported over 22 years. In Australia the prevalence of diabetes increased from 3.4% to 7.4% over 20 years. The growth in number of people with diabetes is expected to be fast in Pakistan, Indonesia, Egypt and Mexico, and somewhat slow in Japan (King H, et al., 1998). Recent studies of geographical and ethnical influences have shown that people of Indian origin are highly prone to diabetes (Shaw JE, et al., 1999). Over the past 30 years, the status of diabetes has changed from being considered as a mild disorder of the elderly to one of the major causes of morbidity and mortality affecting the youth and middle-aged people. It is important to note that the rise in prevalence is seen in all six inhabited continents of the globe. Although there is an increase in the prevalence of Type 1 diabetes also, the major
driver of the epidemic is the more common form of diabetes, viz., Type 2 diabetes, which accounts for more than 90% of all diabetes cases. It is afflicting at least 171 million people worldwide. Even more concerning is the fact that this figure is likely to be more than double to 366 million (79.4 million in India) by 2030 (Wild S, et al., 2004). The prevalence of diabetes is rapidly rising all over the globe at an alarming rate (Huizinga MM and Rothman RL, 2006). Sub-optimal glucose, lipid and hypertension control play a major role in the mortality burden of nearly 3.2 million deaths annually due to diabetes. Globally, one in 20 deaths is attributed to diabetes (8,700 deaths every day or 6 deaths every minute) (Mudaliar S, 2007). Type 1 diabetes is the second most common chronic disease during childhood and the most common form of diabetes in children (1.7 of 1000 children) around the globe. It is estimated to increase from 4.4 million in 2000 to approximately 5.4 million in 2010 worldwide (Zimmet P, et al., 2001). The rate of incidence of the disease is consistently increasing in many countries, the highest being in North Europe, particularly in Finland (37.4/ 100,000 per year). The lowest incidence has been reported from the Zunyi Province of China (0.1/ 100,000 per year) (Karvonen M, et al., 2000). In the rest of Europe, the incidence varies between 7.0 and 19.0 cases/100,000 per year, except in Sardinia (36.0/100,000 per year), where the incidence is highest in the world after Finland followed by Sweden, where the incidence is 34.6/100,000 per year (Onkama et al., 1999). Overall, the highest rates are seen in Native Americans and the Pacific islanders, followed by the Hispanic or Maxican Americans, people originating from Indian subcontinent, Southeast Asians, and African Americans. The prevalence in Europeans is somewhat lower, and diabetes remains rare only among indigenous peoples living a traditional lifestyle (Zimmet P and Shaw J, 2005).

1.3. Current approach to the management of diabetes
The treatment targets for patients with type 2 diabetes include a glycaemic goal of less than 7 per cent (American Diabetes Association, 2006); a fasting glucose level of less than 110mg/dl and a two-hour postprandial plasma glucose level of less than 180mg/dl; LDL less than 100mg/dl (less than 70mg/dl in the presence of diagnosed CVD); triglycerides less than 150mg/dl; HDL more than 40 mg/dl (less than 50mg/dl in women) and blood pressure less than 130/80 mmHg (125/75 with proteinuria) (American Diabetes
In order to achieve the above glycaemic goals, several anti-hyperglycaemic agents are used today, including the insulin secretagogues–sulphonylureas and meglitinides (nateglinide and repaglinide); alphaglucosidase inhibitors (acarbose and miglitol); biguanides (metformin); thiazolidinediones–TZDs (rosiglitazone and pioglitazone); the rapid acting insulin analogues (aspart, lispro, glulysine); and the long acting non-peaking insulin analogues (glargine and detemir) (Yki-Järvinen H, 2001; Inzucchi SE, 2002).

Despite the availability of all the above medications and also numerous glucose measurement devices, glycaemic and other goals have not been achieved in patients with diabetes. In a recent study from the USA (Saydah SH, et al., 2004), only 37% of individuals achieved a glycosylated haemoglobin A₁c (HbA₁c) level less than the American Diabetes Association (ADA) goal of 7%. Even more disappointing was the fact that overall only 7.3% of individuals in this cohort achieved optimal glycaemic, lipid and blood pressure targets. Limited data are available from other countries (Mudaliar, 2005). However, results from the UKPDS (United Kingdom Prospective Diabetes Study) clearly demonstrate that tight glucose and blood pressure control in patients with type 2 diabetes prevents the development of and delays the progression of microvascular complications and possibly macrovascular disease (UKPDS, 1998; UKPDS, 1998; Ramachandiran C, 2005). In addition, results from the UKPDS and other studies like the Heart Protection Study (HPS) have also shown that treatment of concomitant risk factors like lipids and blood pressure and the use of aspirin have favourable effects on cardio-vascular complications and mortality in patients with type 2 diabetes (HPS, 2002; UKPDS 38., 1998; Hansson L, et al., 1998). A more recent follow-up of the Kumamoto study noted that the optimal degree of glycaemic control to prevent or delay complications is a glycosylated haemoglobin (HbA₁c) level of less than 6.5%, a fasting glucose level of less than 110mg/dl, and a two-hour postprandial blood glucose level of less than 180mg/dl (Ramachandiran C, 2005).

Economic factors and limited access to physicians who are knowledgeable in diabetes management are important barriers to achieving ideal glucose control in diabetic patients. Patient compliance is also an important issue. But it is important to recognize that other factors may also play a role. These include the undesirable side effects and
limitations of the currently available oral anti-hyperglycaemic agents, the limitations of the current insulin delivery devices and the drawbacks of the present glucose measurement devices. However, there appears to be hope for the future with the emergence of evolving data on the cardio-vascular benefits of the TZDs, the approval of two new gut hormone analogues with novel mechanisms of action (exenatide and pramlintide), the ongoing progress in alternative modes of insulin delivery (including the recent approval of inhaled insulin) and the development of newer and more reliable continuous glucose measurement devices (both external and implantable). Finally, with the recent publication of the results from the Diabetes Prevention Program (DPPR, 2002) and other studies, the prospect of preventing type 2 diabetes in high risk individuals is an exciting and attainable prospect (Mudaliar, 2005).

A recent study has shown that increasing awareness and empowerment of community can possibly help in the prevention of diabetes and other noncommunicable disorders (Mohan D, et al., 2005).

1.4. Alternative therapy in diabetes
Patients with diabetes mellitus frequently use alternative medicine (Goguen JM, 2001). Alternative therapy, also known as complementary or unconventional medicine, can be defined as therapy that does not conform to the standards of the medical community (Eisenberg DM, et al., 1993). It is commonly used by patients with diabetes (25% of 403 subjects with diabetes mellitus in one study, Ryan EA, et al., 1999) for multiple reasons: to improve glycaemic control, to improve other metabolic parameters (eg, lipid status), in an effort to reduce oxidative stress (i.e., to provide antioxidants) so that the risk of micro- and macro-vascular disease may be reduced, and for unrelated illnesses.

There is evidence from reasonably well-conducted trials that some food and herbal substances may have beneficial effects on glycaemia in patients with diabetes. The evidence is most notable for chromium, soluble fiber, and vitamin C. Fish oil is also beneficial, but only in Type 1 diabetes. Evidences exist for some herbs like Gymnema sylvestre. Shanmugasundaram ERB, et al. (Shanmugasundaram ERB, et al., 1990) did rigorous double-blind studies to prove its efficacies. They showed that it operates to restore normal pancreatic β-cell function so that pancreas can again produce insulin as it
should. This approach apparently was capable of curing Type 1 diabetes in over 60% of the patients. Very recently, Persaud et al., have shown that Gymnema extract stimulate insulin release by increasing cell permeability (Persaud SJ, 1999; Liu B, Jones PM and Persaud SJ, 2009). There is less evidence for ginseng, vanadium, and biotin. Studies demonstrate that there is no impact on glycaemia from the use of coenzyme Q. It is difficult to draw conclusions about magnesium and vitamin E due to the inconsistency of results among studies. More high-quality randomized controlled trials (RCTs) are required to establish the safety and efficacy of these substances (Eisenberg DM, et al., 1993).

1.5. Traditional knowledge of indigenous communities

The role of traditional medicines in the solution of health problems is invaluable on a global level. It is most striking to know that approximately 80% of the people living in less developed countries rely exclusively on traditional medicine for their health care needs (N.R. Faensworth, 1994). It is a well known fact that rural areas, particularly the areas inhabited by the tribal people and socio-economically backward communities are the major source of traditional knowledge about the uses of various plants. Indigenous peoples worldwide have a cosmocentric view of life and have long lived closely with nature. This relationship with their environment spawned reverence and understanding of our natural world. As a result, indigenous traditional healers and their age-old cultural healing knowledge hold countless benefits for our health and wellness (Pesek T, et al., 2005). This knowledge is however dwindling rapidly due to changes towards a modern lifestyle, overgrazing and overexploitation of plant resources.

Evidence can be seen in language. Language is fundamental to culture. Of the 15,000 languages spoken in the world 70 years ago, only 6000 are spoken today (Pesek T, et al., 2005). This is an unfortunate trend, because language embodies knowledge and wisdom as well as cultural heritage and identities (Pesek T, et al., 2005; Buenz, E. 2005). This knowledge and wisdom includes healing traditions which have long helped indigenous communities maintain personal health and wellness. These traditions can help these communities and others maintain a healthier way of life today.
Statistics clearly show that our planetary biodiversity is being lost (WWF, 2004, Hanski I, 2005) and our rainforests are being destroyed at a staggering rate (United Nations Food and Agricultural Organization, 2000). According to the United Nations Food and Agriculture Organization (FAO), we lost between 9 million and 12 million ha per year from 1990 to 2000. The FAO estimates that approximately 0.8 percent of that which is left is destroyed annually and that, at present, total rainforest losses annually range from 5 million ha to over 20 million ha. Assam comprising an area of 78,438 sq km was covered by more than 33% of its geographical areas by forests till 1980s. In 1990, the survey done by the Assam Remote Sensing Application Centre revealed that the percentage of forests covers in Assam stands at around 21%, showing a decline of more than 12% between 1980 to 1990. In between 1990 till 1998 there seems to be a further decline of 5-6% of forest areas due to illegal felling of tree and subsequent encroachment in the forests. Jeffrey McNeely, chief scientist for IUCN, argued at the recent Biodiversity and Health Conference (Arason J, et al., 2005) that the preservation of indigenous cultures and the tropical forests they live in are inseparable and can only be achieved together. Unfortunately, indigenous communities are often biodiversity rich but economically and politically disadvantaged. Therefore, it is vitally important to find ways to minimize, and hopefully stop, the destruction of the forests and to support culturally ethical, ecologically sustainable economic development of the areas which house the enormous amounts of species diversity essential to the health of people and our planet. It has been argued that economic development and loss of forest species used in traditional healing are not inextricably linked, and that perhaps good governance can allow countries to preserve their cultural and natural resources (Buenz E, 2005). To more effectively accomplish this preservation of culture, natural resources and biodiversity, it is clear that sustainable livelihoods must be available for local peoples from the living forests. In the recent past this has been attempted by linking biodiversity prospecting for drug discovery with profit-sharing agreements with indigenous people. Some of these arrangements, however well intentioned and negotiated, have run into complex difficulties, including politics, cross-cultural exchange discrepancies and views that traditional knowledge was being sacrificed for international commercial interests (Nigh R, 2002; Hayden C, 2003; Berlin B and Berlin E, 2003). There have been numerous publications put forth
delineating the complexities of these interactions and suggesting possibilities for future direction. Among these works are ones that discuss forces of globalization as underlying complexities in related scenarios, and that give noteworthy suggestions for socially responsible cross-cultural exchange (Alexiades M, 2004; Bannister K and Barrett K, 2004). Perhaps less controversial and more socially responsible mechanisms for poverty alleviation and ecologically sustainable community development lie in different and more immediately tangible directions.

One alternative that can circumvent potential issues and provide viable in situ and ex situ conservation solutions and support for indigenous communities is the promotion of respect and select integration of traditional healing in national health care systems. (Pesek T, et al., 2005). Medicinal plants are found in forested areas throughout the world, and indigenous peoples have used them in traditional healing for many thousands of years. By studying these relationships between plants and people, we can explore the ability of forest resources to deliver health and wellness options to many groups of people. Benefits can be seen that are applicable to modern day healing in numerous situations, and they can give the world a very practical reason to minimize destruction in these regions. Approximately 80% of the world's population relies on traditional healing for primary health care (World Health Organization, 2002). This is clear evidence that there are substantial market forces that value traditional healing and medicinal plants. Key objectives would include preservation of invaluable medicinal plants by preserving their native areas, as well as preservation of indigenous healing knowledge held by populations in those areas. Plainly, there are intellectual property and cultural issues that need to be addressed. Some plants and traditions are sacred, or used in a ritual context that must be respected. However, many healers share the view that useful botanical treatments should be shared with other people as long as economic and other benefits return to the indigenous communities and their environments. The forest areas and traditional knowledge are declining rapidly. The valuable flora and knowledge can be identified in a timely fashion by conducting systematic ethnobotanical surveys in the areas which are occupied by indigenous tribal communities (Pesek T, et al., 2005).

Ethno-pharmacology and natural product drug discovery remains a significant hope in improving the poor livelihoods of rural communities. Many modern
pharmaceuticals have their origin in ethno-medicine, which relies upon a local pharmacopoeia (Tamboura HH, et al., 2000). The ethno-pharmacology knowledge is a holistic system approach that can serve as an innovative and powerful discovery engines for newer, safer and affordable medicines (Patwardhan B. 2005). Natural products from botanical sources used in traditional medicine may combat multi-drug-resistant infectious diseases (Cassandra LQ, et al., 2008) and multi-factorial chronic diseases like diabetes through the elucidation and validation of biological compounds with novel mechanisms of action. Ethno-botanical and ethno-pharmacological studies normally involve field explorations of indigenous medical knowledge and biodiversity (Pesek T, et al., 2005; Soejato DD, et al., 2005). Ethno-botanical studies of certain areas of Assam have been initiated (Borthakur SK. 1997; Sajem AL and Gosai K, 2006). But there are still many tribal pockets in Assam which can be explored for the search of new traditional medicines.