1. INTRODUCTION

Developed countries have made many advances to control infectious diseases thereby resulting in increased life expectancy of individuals, whereas non-infectious chronic diseases have not received the same attention. Diabetes is one of those chronic diseases which has now become a major global health problem. It is both progressive and life threatening with potentially devastating consequences for health (Suresh, 2006). The International Diabetes Federation (IDF) estimated at least 285 million people worldwide are suffering from diabetes disease (about 6.4% of adults), and it is predicted to reach up to 435 million by 2030 (IDF, 2010). Asia is one of the regions that has experienced high prevalence of diabetes mellitus. For example, the Iranian Diabetes Society (IDS) estimated that at present there are 5 million diabetics in Iran, while less than 100,000 of them participated in Diabetes Patient Education (IDS, 2010). Unfortunately 50% of all the diabetic patients are unaware of their condition or do not have awareness about their disease, and they do not register themselves at the diabetes associations and clinics for patient education (IDF, 2010).

Diabetes can have a significant impact on both physical and psychological functioning which can impair people’s quality of life. In terms of psychological functioning, the demands of diabetes care can have potent impact on mood, both short – term and long-term. Adjustment to diabetes is often accompanied by a variety of negative emotional responses, including anger, guilt, frustration, denial, and loneliness. Frequent hypoglycemic episodes can be exhausting, discouraging and frightening. In addition, chronically elevated blood glucose levels may lead to persistent fatigue, which can exacerbate depressed mood. Psychological stress can also affect diabetes control and the release of counter regulatory hormones often results in elevated glucose levels. In addition stress can disrupt diabetes control indirectly through its impact on diet, exercise and other self-care behaviors (Surwit, 2002).
Both long-term and short-term complications can negatively affect physical functioning. The development of complications can result in sickness absence, disability, premature retirement or premature mortality with loss in earnings and negative impact on quality of life of the person with diabetes and his or her family. The ongoing threat of complications can also be worrying and depressing. When the patients suffer vision loss, kidney damage, significant heart diseases, sexual relationship problems through erectile dysfunction, peripheral neuropathy resulting in chronic pain, amputation, and/or difficulty in walking, or any of host of automatic neuropathy problems, there is likely to be a significant drop in perceived quality of life. The patient may become unable or less able to work, to complete household tasks, or to enjoy leisure activities or normal family life. The patient’s ability to function independently may also be impaired. Psychologists can play an important role in helping people live well with diabetes. Diabetes presents a significant challenge and stress for diabetics and those around them. Psychologists are well trained in behavior change interventions. They understand the problems in diabetes self-care, and can help the individual to overcome the difficulties and to change their behavior. In addition to the behavioral demands of diabetes there are emotional and social problems that can arise. Diabetes is often perceived as a burden. It can be hard to accept the disease, and feelings of depression (feeling overwhelmed), anxiety (fear of complications or hypoglycemia) and frustration (with the demands of self-care, or the medical system) are common. Young people, especially young women with Type 1 diabetes, are at risk for developing eating disorders (weight loss through insulin omission). Social problems can result from diabetes as well. Many individuals who do not have diabetes find it difficult to understand the needs of someone with diabetes. Even if they mean well, often those without diabetes act in ways that are not
supportive. For example, friends can encourage a person with diabetes to eat something they shouldn't because "once can't hurt". Psychologists work with individuals with diabetes in a number of ways. They can help the newly diagnosed individual to understand the impact of diagnosis and their role in managing it. They can help them learn the daily behaviors needed for successful maintenance. They are trained to recognize and treat psychological distress, including depression and anxiety that can develop when living with an unpredictable disease. Psychologists can be helpful in assisting the individual to develop and maintain the motivation needed to follow the daily routine of self-care. As well, family therapy and strategies to deal with social pressures are often beneficial to those with diabetes and their loved ones. Many people think that diabetes treatment is very simple, once the right amount of medication or insulin has been determined. Unfortunately, management is much more complicated. Psychological wellbeing is an important goal of medical care, and psychosocial factors are relevant to nearly all aspects of diabetes management. They can help the newly diagnosed individual to understand the impact of diagnosis, and their role in managing it. They are trained to recognize and treat psychological distress, including depression and anxiety that can develop when living with an unpredictable disease. Psychologists can be helpful in assisting the individual to develop and maintain the motivation needed to follow the daily routine of self-care. As well, family therapy and strategies to deal with social pressures are often beneficial to those with diabetes and their loved ones (Suresh, 2006).

The aim of this study is to show the importance of Diabetes Patient Education on Anxiety, Depression and Perceived Stress among Type 2 diabetics.
1.1. Diabetes

1.1.1. Definitions and description

Diabetes is a chronic disease that occurs when the pancreas does not produce enough insulin, or when the body cannot effectively use the insulin it produces. Insulin is a hormone that regulates blood sugar. Hyperglycemia, or raised blood sugar, is a common effect of uncontrolled diabetes and over time leads to serious damage to many of the body's systems, especially the nerves and blood vessels. After a meal, the portion of the food a person eats is broken down into sugar (glucose). The sugar then passes into the bloodstream and to the body’s cells via a hormone (called insulin) that is produced by the pancreas. Normally, the pancreas produces the right amount of insulin to accommodate the quantity of sugar; however, when the person has diabetes, either the pancreas produces little or no insulin or the cells do not respond normally to the insulin. Sugar builds up in the blood, overflows into the urine, and the passes from the body unused (WHO, 2010).

1.1.2. Diabetes facts

- Diabetes deaths are likely to increase by more than 50% in the next 10 years without urgent action.
- In 2004, an estimated 3.4 million people died from consequences of high blood sugar.
- Most people with diabetes in low and middle income countries are middle-aged (45-64), not elderly (65+).
- Diabetes causes about 5% of all deaths globally each year.
- Almost half of diabetes deaths occur in people under the age of 70 years; 55% of diabetes deaths are in women.
- Healthy diet, regular physical activity, maintaining a normal body weight and avoiding tobacco use can prevent or delay the onset of diabetes (WHO, 2010).
1.1.3. Epidemiology and prevalence

The International Diabetes Federation (IDF) estimated at least 285 million people worldwide are suffering from diabetes disease (about 6.4% of adults), with 46% of all those affected in the 40-59 age group; it is however predicted that it may reach up to 435 million by 2025 (IDF, 2010). Asia is a one of the regions that has high prevalence of diabetes mellitus. Iranian diabetes society estimated that there are approximately 5 million diabetics in Iran. (IDS, 2010).

1.1.4. Type of diabetes

There are three main types of diabetes:

1.1.4.1. Type 1 diabetes (previously known as insulin-dependent, juvenile or childhood-onset) is characterized by deficient insulin production and requires daily administration of insulin.

1.1.4.2. Type 2 diabetes (formerly called non-insulin-dependent or adult-onset) results from the body’s ineffective use of insulin. Type 2 diabetes comprises 90% of people with diabetes around the world, and is largely the result of excess body weight and physical inactivity. Until recently, this type of diabetes was seen only in adults but it is now also occurring in children.

1.1.4.3. Gestational diabetes is hyperglycemia with onset or first recognition during pregnancy. Symptoms of gestational diabetes are similar to Type 2 diabetes. Gestational diabetes is most often diagnosed through prenatal screening, rather than reported symptoms.
Impaired glucose tolerance (IGT) and impaired fasting glycaemia (IFG) are intermediate conditions in the transition between normality and diabetes. People with IGT or IFG are at high risk of progressing to Type 2 diabetes, although this is not inevitable (WHO, 2010).

1.1.5. Sign and Symptoms

The onset of Type 2 diabetes is gradual and therefore hard to detect. Indeed, some people with Type 2 diabetes show no obvious symptoms early on. These people are often diagnosed several years later, when various complications are already present.

- The onset of Type 2 diabetes can include symptoms such as:
  - Abnormal thirst and a dry mouth
  - Frequent urination
  - Extreme tiredness/lack of energy
  - Sudden weight loss
  - Slow-healing wounds
  - Recurrent infections
  - Blurred vision.

1.1.6. Risk factors for type 2 diabetes: (Etiology)
1.1.6.1. Age

90-95% of people with diabetes have type 2 diabetes. This type usually occurs in people over the age of 40 but is now also affecting children and adolescents to a greater extent. The older you are, the greater your risk of diabetes.
1.1.6.2. Obesity

Over 80 per cent of people with type 2 diabetes are overweight. The more overweight you are, the greater your risk of diabetes.

1.1.6.3. A family history of diabetes

Research has shown that people are more at risk if there is a history of diabetes in close family members. The closer the relative, the greater your risk of diabetes.

1.1.6.4. Physical inactivity

Research has shown that people who do not lead an active life are more at risk of developing type 2 diabetes. The less exercise you do, the greater your chances of developing diabetes.

1.1.6.5. Impaired glucose tolerance (IGT)

A healthy person’s blood sugar is usually between 70 and 110 mg/dL (milligrams of glucose in 100 milliliters of blood) or, in millions, between 3.9 and 6.0 mmol/L. Impaired glucose tolerance is a level of blood glucose which is higher than normal, but not high enough to be in the range where doctors classify this as diabetes.

1.1.6.6. Race/ethnicity

As far as we know, race and ethnicity are important in determining the possibility of a person developing diabetes. Little research, however, has been undertaken outside of the United States. Within that population, African-Americans, Hispanic Americans, Native Americans, Asian-Americans and Pacific Islanders are more likely to have diabetes.
1.1.6.7. Diabetes during pregnancy

Some women develop a temporary type of diabetes called ‘gestational diabetes' when they are pregnant. Gestational diabetes develops in 2-5% of all pregnancies, but usually disappears when the pregnancy is over. However, women who have had gestational diabetes or who have given birth to a large baby (4kg/2lb or greater) are at a greater risk of developing type 2 diabetes at a later stage in their lives (IDF, 2010).

1.1.7. Complications

Many adults have had diabetes for several years before their symptoms are recognized. By the time they are diagnosed, a great many have already started to develop the complications of diabetes - visual impairment, kidney failure, heart disease, stroke and nerve damage. In many parts of the world, people with diabetes are not diagnosed at all. Spotting diabetes early means that it can be treated and the risk of the serious complications can be greatly reduced. (IDF, 2010)

Complications of diabetes

1.1.7.1. Short-term complications

1.1.7.1.1. Low blood sugar (hypoglycemia)

A person who takes insulin is going to face the problem of their blood sugar falling too low at some point (because they have overestimated the insulin they need, have exercised more than anticipated or have not eaten enough). Hypoglycemia can be corrected rapidly by eating some sugar. If it is not corrected it can lead to the person losing consciousness. It is important that the person with diabetes recognizes the signs of hypoglycemia.
1.1.7.1.2. Ketoacidosis

When the body breaks down fats, acidic waste products called ketones are produced. The body cannot tolerate large amounts of ketones and will try to get rid of them through the urine. However, the body cannot release all the ketones, and they build up in your blood causing ketoacidosis which is a severe condition caused by lack of insulin. It mainly affects people with Type 1 diabetes.

1.1.7.1.3. Lactic acidosis

Lactic acidosis is the buildup of lactic acid in the body. Cells make lactic acid when they use glucose for energy. If too much lactic acid stays in the body, the balance tips, and the person begins to feel ill. Lactic acidosis is rare and mainly affects people with Type 2 diabetes.

1.1.7.1.4. Bacterial/fungal infections

People with diabetes are more prone to bacterial and fungal infections. Bacterial infections include sties and boils. Fungal infections include athlete’s foot, ringworm and vaginal infections.

1.1.7.2. Long-term complications

1.1.7.2.1. Eye disease (retinopathy)

Eye disease, or retinopathy, is the leading cause of blindness and visual impairment in adults in developed societies. About 2% of all people who have had diabetes for 15 years become blind, while about 10% develop a severe visual impairment. In fact, in developed countries, diabetes is often discovered when people get routine eye exams, and the ophthalmologist discovers intraocular pressure from glaucoma caused by Type 2 diabetes.
1.1.7.2.2. Kidney disease (nephropathy)

Diabetes is the leading cause of kidney disease (nephropathy). About one third of all people with diabetes develop kidney disease and approximately 20% of people with Type 1 diabetes develop kidney failure.

1.1.7.2.3. Nerve disease (neuropathy)

Diabetic nerve disease or neuropathy affects at least half of all people with diabetes. There are different types of nerve disease which can result in a loss of sensation in the feet or in some cases the hands, pain in the foot and problems with the functioning of different parts of the body including the heart, the eye, the stomach, the bladder and the penis. A lack of sensation in the feet can lead to people with diabetes injuring their feet without realizing it. These injuries can lead to ulcers and possibly amputation.

1.1.7.2.4. Diseases of the circulatory system

Disease of the circulatory system, or cardiovascular disease, accounts for 75% of all deaths among people with diabetes of European origin. In the USA, coronary heart disease is present in between 8% and 20% of people with diabetes over 45 years of age. Their risk of heart disease is 2-4 times higher than those who do not have diabetes. It is the main cause of disability and death for people with Type 2 diabetes in industrialized countries.

1.1.7.2.5. Amputation

Diabetes is the most common cause of amputation that is not the result of an accident. People with diabetes are 15 to 40 times more likely to require lower-limb amputation compared to the general population.
1.1.7.2.6. Heart disease and stroke

Diabetes increases the risk of heart disease and stroke. 50% of people with diabetes die of cardiovascular disease (primarily heart disease and stroke). The overall risk of dying among people with diabetes is at least double the risk of their peers without diabetes (WHO, 2010).

1.2. Anxiety

Anxiety is an unpleasant emotional state consisting of psycho physiological responses to anticipation of unreal or imagined danger, ostensibly resulting from unrecognized intrapsychic conflict. Physiological concomitants include increased heart rate, altered respiration rate, sweating, trembling, weakness and fatigue; psychological concomitants include feelings of impending danger, apprehension and tension (Corsini, 1999).

1.2.1. Diabetes-related Anxiety

Patients with diabetes often worry about lasting complications of the disease, how to manage the cost of the disease, and how it will affect their families or their jobs. A meta-analysis of anxiety prevalence among individuals with diabetes, with combined sample of 2,584 participants with diabetes and 1492 non-diabetes, indicated that 14 % of those with diabetes experienced generalized anxiety disorder, and that 40% experienced elevated anxiety symptoms (Grigsby et al., 2002). In addition, 13% of youth diagnosed with diabetes developed an anxiety disorder within ten years after the diabetes diagnosis (kovacs et al., 1997). Although anxiety symptoms were higher among women than men, a meta-analysis of 11 studies which assessed the relationship between anxiety and control of blood sugar found that anxiety rates for
those with Type 1 and Type 2 diabetes were similar. However, when only studies that utilized diagnostic interviews to assess anxiety were included, anxiety was significantly related to glycemic control with a significant effect size (Anderson et al., 2002). Some individuals have exhibited diabetes-specific anxiety, such as fear of hypoglycemia (FH). Studies have found relationships between FH and poor glycemic control, (Cox et al., 1987), higher trait anxiety and post hypoglycemic experiences, difficulty distinguishing between anxiety and hypoglycemia (Polonsky et al., 1992), as well as higher perceived Stress, frequency of past hypoglycemic episodes, and greater daily variations in blood sugar (Irvin et al., 1992). Some individuals attempt to avoid this fear hypoglycemia, compromising their glycemic control by administering lower insulin dosage/maintaining higher blood sugar levels (Surwit et al., 1982), or over eating in response to early sighs of hypoglycemia if individuals engage in this avoidance behaviors they may increase risk for the long-term medical complications associated with hyperglycemia (Cox et al., 1987).

Early and intensive treatment can influence patients’ psychological outcomes, thereby leading to relatively more anxiety and less self-efficacy in the 1st year after diagnosis (Thoolen et al., 2006). Because some individuals 1) report ongoing intrusive worry about hypoglycemia; 2) become anxious in response to this intrusive ideation, even when blood sugar is not low; and 3) react with avoidance behaviors that compromise their diabetes regimen and pose serious long-term health risks, the authors evaluated the full post traumatic stress symptomatology among individuals using thigh control regimens. About 25% of patients reported symptoms consistent with current post traumatic stress disorder (PTSD) about hypoglycemia (Myerset al., 2007).
1.3. Depression

Depression is a mental state characterized by feelings of extreme sadness or despair, a pessimistic sense of inadequacy and a despondent lack of activity that presents with depressed mood, loss of interest or pleasure, feelings of guilt or low self-worth, disturbed sleep or appetite, low energy, and poor concentration last for at least two weeks or longer. These problems can become chronic or recurrent and lead to substantial impairments in an individual's ability to take care of his or her everyday responsibilities. At its worst, depression can lead to suicide, a tragic fatality associated with the loss of about 850,000 lives every year (Corsini, 1999).

1.3.1. Symptoms of Depression:

These are based on the Diagnostic and Statistical Manual of the American Psychiatric Association, 4th Edition (DSM-4).

- Depressed mood for most of the day
- Decreased pleasure in normal activities
- Difficulty sleeping or significantly increased need to sleep
- Weight loss or weight gain
- Feelings of guilt or worthlessness
- Low energy level
- Difficulty making decisions of concentrating
- Suicidal thoughts.

1.3.2. Diabetes–related Depression

The co-morbidity of diabetes and depression has received enough empirical investigation to generate several meta analytic studies to summarize the findings, first a meta analysis of nine studies published prior to January, 2005 that assessed the
relationship of depression to the subsequent development of Type 2 diabetes suggests that depressed adults are 37% more likely than those without depression to develop Type 2 diabetes (Knol et al, 2006).

In addition, depression appears more common among individuals who have diabetes than those without diabetes. Although some studies have found depression to be six times higher among those with diabetes (Lustman et al., 1986), a meta-analysis of 42 studies indicates an odds ratio of 2:1, that is, depression is twice the prevalence among those with diabetes compared to those without diabetes. In another study, depression rates for those with diabetes were 28% among women and 18% among men, with rates as high as 32% in sample seeking clinical services (Anderson et al., 2001). Major depression in another sample was present in at least 15% of patients with diabetes (Garvard et al., 1993).

Depression is associated with poorer glycemic control, health complications, decreased quality of life and increased healthcare costs (Egede et al., 2002). Although women showed higher absolute rates of depression than men, the odds ratio was consistent for sexes as well as for Type 1 and Type 2 diabetes, women had twice the rate of depression than that of men. A review of depression prevalence among individuals with Type I diabetes that included five studies since the Anderson and colleagues meta-analysis (2001) indicated 125 of persons with diabetes has co-morbid depression, compared to a 3.2 % rate of depression for those without diabetes (Barnard et al., 2006).
A recent study of 2,672 individuals with diabetes found that 14% reported mild depression symptoms, 8.6% reported moderate or severe depression symptoms, and that greater depression was associated with hyperglycemia and frequency of emergency medical visits. At particularly high risk for depression within this study were males with juvenile Type 2 diabetes and women with Type 1 diabetes who had co-morbidities (compared to women without comorbidities; Lawrence et al., 2006). Twenty-seven percent of individuals diagnosed with diabetes in childhood or adolescence experienced a major depressive episode within ten years after the diabetes diagnosis (Kovacs et al., 1997). In addition, meta-analytic studies have shown significant and consistent relationships between depression and poor glycemic control (Lustman et al., 2000; Lustman & Clouse, 2005) and increased diabetic complications (de Groot et al., 2001).

Depression has also shown to relate to greater perceived symptoms burden, perceived lack of control, and expectations for worse outcomes among individuals with Type 2 diabetes as well as poorer quality of life (Paschalides et al., 2004). In a series of studies of more than 4,000 individuals with diabetes, co-morbid depression corresponded to a tenfold increase in disability and fourfold increase in people experiencing 20 or more days of reduced household work compared to those without depression (Vonkoff et al., 2005). Others reported a 70% increase in health care cost (Simon et al., 2005). Furthermore, individuals with Type 2 diabetes who reported either co-morbid major depression or minor depression (i.e., clinically significant depression that was sub-diagnostic for a major depressive episode) were significantly more likely to die than those without depression over the subsequent 3 years (Katon et al., 2005). Taken together, depression appears to be a significant risk factor for developing Type 2 diabetes, diabetes appears to place people at twice the risk for
depression, and depression is associated with poorer glycemic control and greater development of diabetic complications, such as nephropathy, neuropathy, retinopathy, macro vascular changes, and sexual dysfunction (de Groot et al., 2001). Despite the increased prevalence of depression among those with diabetes and the deleterious impact upon medical outcomes, depression continues to be under diagnosed and undertreated even with evidence that effective treatments exist (Steed et al., 2003). Among patients with diabetes from nine primary care practices who reported clinically significant depression in a systematic screening, 49% received antidepressant pharmacotherapy, and only 6.7% received four or more psychotherapy sessions during the previous 12 months (Katon et al., 2004) indicating that many of those diagnosed were not adequately treated.

Diabetics who are battling with depression sometimes do not have the energy to do all the minor things it takes to control diabetes. They may not have a healthy diet, do not take their medications on time, or do the exercise they need. This alone could go a long way towards explaining why depressed people with diabetes are more likely to develop blindness and other complications depression can affect patients' control of their diabetes in indirect ways. For example, these patients may have a lack of concern for taking care of themselves. They often do not sleep well, or they sleep too much and are not as attentive to their basic daily needs as they should be. They also often are unconcerned about daily diabetic requirements, such as eating properly, taking the proper medications, or performing regular self-monitoring of blood glucose. People who are not diabetic have compensatory mechanisms to keep blood sugar from swinging out of control; however, for people with diabetes, those mechanisms are either lacking or blunted, so they cannot keep their blood sugar under control (Suresh, 2006).
1.4. Perceived Stress

The perceived stress is the degree to which situations in one’s life are appraised as stressful. It showed that people to tap how unpredictable, uncontrollable, and overloaded respondents find their lives (Cohen, Kamarck, & Mermelstein, 1983).

1.4.1. Diabetes related to stress

It is hard to dispute that most of people live life at breakneck speed. It is the nature of a fast-paced society, where numerous family, social, and work obligations can easily overpower precious time and resources. But for people with diabetes, both physical and emotional stress can take a greater toll on health. Patients with diabetes commonly experience long-term stress or depression. It often is a direct result of the disease itself due to the emotional ups and downs patients experience during chronic management. The disease itself can be overwhelming and often leaves a patient wondering, "Why me?" Identifying these patients and helping them with tips to manage stress effectively can have a positive impact, not only on their emotional well-being, but on their long-term clinical outcomes as well. Sources of stress can be physical or mental. Examples of physical stresses include infections, trauma, injuries, or sickness. Mental stresses include relationship difficulties/ financial concerns, and pressure from a stressful job. Physiologically the body responds to stressors by secreting the counter-regulatory hormones such as epinephrine, cortisol, and glucagon. These hormones, although helpful to boost energy when needed, can work counterproductively to keep the body at a constant state of arousal. Think of the fight-or-flight response. We cannot fight danger when our blood sugar is low, so it rises to help meet the challenge. Both physical and emotional stress can prompt an increase in these hormones, resulting in an increase in blood sugars (Suresh, 2006).
The stressful life events appropriate for middle-age and elderly adults showed that somatic illness of self has great importance for people. The Social Readjustment Rating Scale (SRRS) developed by Holmes and Rahe (1967) showed that the sixth item of stressful life events for people is personal injury or illness. Stress is one of the risk factors among people with Diabetes Type 2 (IDF, 2010).

Diabetes presents a significant challenge and stress for diabetics and those around them (Suresh, 2006). Stress has been found to have both direct and indirect effects on metabolic control in adults: a direct effect occurring as a result of an increase in counter regulatory stress hormones, which in turn raise blood sugars (Surwit & Feinglos, 1988; Aitkens et al., 1992) and indirect effect resulting from stress affecting self-care behavior, which in turn affects glycemic control (Bradley, 1979). However, much of the stress research has been experimental, with stress being induced artificially under laboratory conditions (Helz & Templeton, 1990). Such experiments have yielded mixed findings. While field studies have produced more consistent evidence that stress affect metabolic control directly (Halford et al., 1990) and indirectly (Peyrot & Mc Murry, 1985), the findings are by no means conclusive, and to date there have been no such studies with a clearly defined diabetes population (Cox & Gonder-Frederick, 1992).

What is clear from the more recent studies (e.g., Griffith et al., 1990) is that high stress levels do not lead uniformly to poor metabolic control as was once believed. It would appear that in times of stress, factors such as social support can serve as an important buffer. It would also seem that the findings depend in part on the way in which stress is measured. For example, when Cox et al. (1984) defined
stress only in terms of ‘daily hassles’, social support did not feature as an intervening variable. One reason for the conflicting findings may be that stress, related to support with diabetes, could be serving as a confounding variable. For example, the survey conducted by Warren and Hixenbaugh (1996) showed that regular reminders from significant others regarding self-care (often assumed by health professionals and researchers to be supportive) were not only perceived by 18% of the sample as stressful but led regularly to them deliberately not performing the required behavior. Importantly, a further 14% reported that they were unsure if reminders from others led them deliberately to neglect self-care. However, in this same sample, patient reported that support from their ‘significant others’ did help them to cope with diabetes during the occurrence of major life events (Warren & Hixenbaugh, 1996).

It may be that, provided that the stress caused by reminders of self-care is at a relatively low level, support from significant others does act as a buffer in coping with major life events. However, if the amount of stress caused by these reminders is great, then the support in relation to life events loses its capacity as a buffer against stress. This is borne out by the fact that not all diabetic patients saw stress as equally relevant with the pattern being that those who reported conflict concerning their diabetes with their ‘significant others’ were the ones who found stress more relevant to their condition (Warren & Hixenbaugh, 1996).

More research is needed to determine the conditions under which people with diabetes are most vulnerable to the effects of stress. Such research needs to take account of demographic variables (such as age and type of diabetes) and the way in which stress is defined and measured. For example, Aitkens et al. (1992) found from a
study with diabetes that daily fluctuations in stress (the highs and lows) were more relevant to diabetic functioning than mean stress levels. It is the latter which have usually been investigated in the past. Future research will need to allow for the fact that what is perceived as a mediator of stress by one patient may be viewed by another as a stressor. These issues have important implications for the cost-effectiveness of stress management interventions. Bradly (1995), having reviewed the stress literature, asserted that despite the fact that many clinics in the U.S. now include stress management as a part of routine treatment, stress interventions will only be of use to patients with poor control if they are currently experiencing considerable stress in their lives.

Patients may have a lack of concern for taking care of themselves. They often do not sleep well, or they sleep too much and are not as attentive to their basic daily needs as they should be. They also often are unconcerned about daily diabetic requirements, such as eating properly, taking the proper medications, or performing regular self-monitoring of blood glucose. People who are not diabetic have compensatory mechanisms to keep blood sugar from swinging out of control, but for people with diabetes, those mechanisms are either lacking or blunted, so they cannot keep a lid on blood sugar levels. Stress plays a more direct role in the control of blood sugar than it does in any other disease. People with diabetes should stay conscious of eating well and exercising regularly. It is a good idea to check blood glucose levels more frequently when they are ill or under stress and to drink plenty of fluids as so as not to get dehydrated.
1.5. Diabetes Patient Education

Diabetes Patient Education has long been recognized as a vital and integral component of successful diabetes care. However, complex and daily requirements such as medication taking and adjustment, self-monitoring of blood glucose (SMBG), foot care, dietary modification and attendance for regular medical care place a psychological and financial burden on people with diabetes. H. G. Lawrence, the co-founder of the British Medical Association, himself a physician and a person with diabetes, is reputed to have stated that the person with diabetes must be his own doctor, nurse and lab technician. It has been pointed out that; while there have been many advances in the medical treatment of diabetes, their implementation puts enormous demand on people with diabetes and their careers (Strine et al., 2005; Clark, 2008). Self-management underpinned by patient education and support are paramount for acquisition of necessary knowledge and problem solving skills (Deakin et al., 2005; Clark, 2008).

According to a technical report published by Diabetes Australia (Colagiuri & Goodall, 2004), there is a vast body of literature relating to education theory but no general agreement on how learning takes place. From their literature review of education theory, the authors conclude that while there is no one theory which can be used for all people in all situations, there is general agreement that the learner must be an active participant in the learning process and that there must be a variety of learning experiences for optimal learning to occur. However, there are major differences between the theories. For example, cognitive learning theory primarily deals with how the brain structures and organizes what we learn. Learning is viewed as a developmental process and learners are considered to test new information
against existing ideas, beliefs and experience. Constructivist theory considers that learners actively construct new ideas and theories from existing experience and the new ideas and concepts being presented. Humanism provides the core theoretical base for self-directed learning. Humanist theory considers that real learning is something that the learner discovers for him/herself, with a fundamental principle that learning must be based on learner-centered objectives identified by the learner(s).

The Diabetes Australia report (Colagiuri & Goodall, 2004) cites educational theorists and researchers who propose that elements of each of these theories are necessary in the development of information and education for people with diabetes. Behaviorist theory provides tools and methods useful for teaching skills oriented tasks such as injecting insulin; cognitive theory explains the need to consider the prior experiences and beliefs of the person with diabetes and further, explains why education strategies that fail to do so are not perceived as relevant; constructivist theory also reinforces the need to take into account the prior experience and beliefs of the individual but goes further to demonstrate the need for learning to be realistic, based on and delivered in, settings that are relevant and meaningful to the individuals life experience. Humanist theory provides the basis for empowerment, with its emphasis on collaborative learning, including collaborative determination of what is to be learned, how it is to be learned and how that learning is to be demonstrated. Humanist theory emphasizes that for effective learning the learner must feel secure, respected, esteemed and empowered (Colagiuri & Goodall, 2004).

Early research into the impact of diabetes education has been criticized for focusing on assessing improvements in knowledge. Nonetheless, it is now widely agreed that, although knowledge alone is not sufficient to effect behavior change, it is
a vital prerequisite to such changes. The main goals of diabetes patient education have been expressed as promoting self-management that in turn may lead to long-term diabetes control to reduce associated morbidity and mortality, and to help people with diabetes balance short and long-term quality of life (QOL) against the burden of daily intensive self-management (Corabian & Harstall, 2001; Snoek & Visser, 2003). Several national and international reports have identified a lack of agreed benchmarks, standardized outcomes and indicators for diabetes patient education (Glasgow & Osteen, 1992; Fain et al., 1999; Home et al., 1999; Naqib, 2002; Colagiuri et al., 2003a; IDF, 2003; Colagiuri & Goodall, 2004).

To address the serious implications of these issues for patient outcomes and for the design and evaluation of educational interventions, Diabetes Australia commissioned the development of a National Consensus on Outcomes and Indicators for Diabetes Patient Education (Eigenmann & Colagiuri, 2007).

The National Consensus Report defined diabetes patient education as:

“an interactive process that facilitates and supports the individual and/or their families, cares or significant social contacts to acquire and apply the knowledge; confidence; practical, problem-solving and coping skills needed to manage their life with diabetes to achieve the best possible outcomes within their own unique circumstances”.

Diabetes education should have a documented curriculum with specific aims and learning objectives and should be delivered by a trained educator (UK DH and Diabetes UK, 2005). The variety and complexity of diabetes self-care is onerous and
ongoing and is critically important to the avoidance of short and long-term diabetes complications. It is imperative that people with diabetes have access to opportunities to acquire the necessary information and skills to self-manage their condition (Diabetes UK, 2005) and numerous guidelines and reports recommend that all people with diabetes should have access to information about self-management of their diabetes (Home et al., 1999; NICE, 2003; IDF, 2005).

Nonetheless, the evaluation of educational interventions is problematic. The traditional lack of well defined and clearly described inputs and standardized outcome measures hinders our ability to generalize about the impact of diabetes education and its contribution to the health and economic status of individuals and populations with diabetes (Peeples et al., 2001; Colagiuri et al., 2003a).

1.5.1. Aims of the Diabetes Patient Education

Education is one of the most important methods for prevention, treatment, and control of chronic diseases including diabetes. Self-management is key to good diabetes care and patient education should be at the heart of any service. The key element to facilitate and support people's self-management is through the provision of information, education and psychological support. People with diabetes need the knowledge, skills and motivation to assess their risks, to understand what they will gain from changing their behavior or lifestyle and to act on that understanding by engaging in appropriate behaviors (Suresh, 2006).

Studies have shown the importance both of tight blood glucose control and of lowering blood pressure in delaying the onset or progression of complications. The value of patient education is evident from research demonstrating that patients who
never received diabetes education showed a striking four-fold increased risk of a major complication (Nicolucci et al., 1996). Education programs targeted at specific self-care behaviors increase the performance of such activities such as foot care (Litzelman et al., 1993), or blood glucose monitoring, resulting in a reduction in the development of complications. Blood Glucose Awareness Training (BGAT) has been shown to be effective in teaching people with Type 1 diabetes to recognize accurately blood glucose levels. This reduces serious hypoglycemic reactions, prevents hospitalization, improves self-confidence and reduces fear of hypoglycemic reactions (Cox et al., 1995).

Patient Education would therefore need to incorporate, or be provided in addition to, strategies for goal setting, problem-solving, emotional coping, stress management and obtaining social support and motivation. It also needs to take into consideration the learning process and its variability during the different life stages of individuals and their health (Suresh, 2006).

1.5.2. Current approaches in Diabetes Patient Education

Patient Education can be delivered on a one-to-one basis or in a group, and there are also innovative techniques involving distance learning or multimedia packages. The appropriate format should be determined by patient's needs and choices. Group learning remains however a popular technique in terms of cost-effectiveness and convenience for patients and providers of patient education and its advantages include: improving relationships between patients and health care professionals, and allowing peer interaction. Moreover, it is also thought to promote adaptive changes in behavior. A recent randomized control trial assessing group
versus individual diabetes education found that group diabetes education was similarly effective in delivering key educational components and may allow for more efficient and cost-effective methods in the delivery of patient education programs. (Rickheimetal, 2002).

Group meetings can help people to overcome feelings of isolation and bring relief by providing the opportunity for people to talk to others with similar experiences and share knowledge. Most of the initiatives reviewed so far in the literature are ones reported in US-based studies. These relate to interventions which can largely be grouped under following categories (Mclntosh, 2000).

- Information-providing programs which tend to be didactic in nature, aiming to improve knowledge and increase awareness of risks and benefits.

- Interventions covering both information and teaching of skills in relation to diabetes self-care, diet, blood glucose monitoring etc., whether aimed at individuals or groups, clinic or home teaching. These interventions tend to incorporate elements of demonstration and feedback, e.g. showing how to execute skills, observing performance, correcting errors. Outcomes examined tend to be mainly physiological ones, e.g. HbA1c, blood pressure, weight, and knowledge.

- Behavioral interventions relating to intensive programs based on different models or theories targeting mainly any health-related behavior and lifestyle modification e.g. weight loss, diet and exercise (Peyrot, 1999). They involve specific techniques and elements such as:
  - Goal setting: establishing specific/appropriate and realistic goals; behavioral contracting to increase commitment.
• Problem-solving: helping patients find ways to overcome barriers to implementing intentions.

• Social learning, group therapy, counseling, support or self-help groups: helping patients maintain positive emotional well-being and attitude change.

Patient empowerment programs looking to increase patient participation e.g. giving choice in the content of a program, providing them with training in decision-making and negotiation skills. These programs don't aim to improve adherence or compliance to treatment; patients learn how to make changes but set their own goals in achieving them (Suresh 2006).

1.5.3. Components of Diabetes Patient Education

Patient Education should be a planned life-long process, starting from the point of diagnosis and remaining as an essential component of diabetes care. It should aim to facilitate self-care in people with diabetes, helping them to acquire new knowledge and skills so that they may make informed choices and facilitate self-directed behavior change, and also adapt to various individual and social life events, including the development of subsequent complications.

For both Type 1 and Type 2 diabetes the aim of patient education should be to optimize:

• Knowledge of diabetes and the aims of its management.

• Motivation and attitudes to self-care.

• Ability to define and agree personal health-care targets and develop strategies for meeting them.

• Health behaviors which affect diabetes management.

• Empowerment in communicating with the professional members of the healthcare team effectively.
At and shortly after diagnosis, basic facts are necessary for the initial management of diabetes and patient education should provide the minimum instruction to obtain control over the new situation and basic supportive information on: The nature, symptoms and outcomes of diabetes - this should include allaying fears or anxieties and addressing preconceived ideas of diabetes.

- Healthy eating and snacks.
- Physical exercise. Self-injecting.
- Awareness of acute complications such as hypoglycemia and how to deal with them.
- Self-monitoring of glucose - knowledge of HbA1c and how to achieve improved values.
- Making appropriate lifestyle changes, dealing adequately with stress and Dealing with psychological aspects of living with diabetes.

In the months following diagnosis, follow-up education should expand upon these basic topics and in addition should cover elements essential to diabetes care such as:

- Ensuring optimal and appropriate use of therapy, whether tablets or insulin.
- Managing nutrition and physical activity effectively.
- Being able to detect and manage acute complications of therapy such as hypoglycemia.
- Being aware of late complications and how to prevent, detect and treat them.
- Being able to monitor record and act appropriately on the results of therapy.
- Making appropriate responses to unpredicted and new problems.
- Dealing with special situations e.g. travel, illness.
• Making appropriate lifestyle changes and dealing adequately with stress.
• Dealing with psychological aspects of living with diabetes (Suresh, 2006).

In addition to patient education providing information and improving knowledge, maintaining behavior change is also important in achieving positive longer-term benefit (McIntosh et al, 2000). Acknowledging people's feelings and concerns and helping them to set realistic goals are best achieved by using a patient-centered approach and creating a positive environment for behavioral change (Suresh, 2006).

1.5.4. Delivery of Diabetes Patient Education

Diabetes education can be successfully delivered by various health care professionals, including physicians, dietitians, nurses, psychologists, social workers, pharmacists or other health professionals (Corabian & Harstall, 2001). However, comprehensive diabetes education is usually provided by diabetes educators - who have additional training in diabetes care and education in addition to basic training in their specific discipline.

A variety of settings including hospital in-patient wards and outpatient clinics, specialist diabetes centers, primary care practices and community locations are used to provide diabetes education. Australia has a network of specialist ambulatory care Diabetes Centers which are usually attached to metropolitan public hospitals but are increasingly found in major rural centers. These Centers provide comprehensive diabetes care including treatment and patient education delivered by a multidisciplinary team (Eigenmann & Colagiuri, 2007) and are the internationally dominant model of diabetes care. Other education settings, which seek to promote
ease of access and which recognize the influence of community networks, include primary care, community centers, pharmacies and other community gathering places e.g. churches (Norris et al., 2006) with practice nurses being an increasingly common source of diabetes education in the community/primary care setting.

Diabetes education is believed to be most effectively delivered face-to-face although videos and web-based interventions can play an important role in augmenting face-to-face education (Krishna et al., 1997; Balas et al., 2004). Most of the available research establishing the effectiveness of diabetes education has studied group education (Funnell, 2004; Loveman et al., 2008) However, a recent Cochrane systematic review provides evidence of the effectiveness of individual patient education for people with Type 2 diabetes (Duke et al., 2009). Although both psychosocial and health outcomes have been improved through a variety of diabetes education programs, reinforcement and ongoing self-management support is vital if these benefits are to be sustained (Funnell, 2004; Duke et al., 2009).

Over the last decade or two the focus of diabetes education has shifted from a doctor/nurse didactic information-giving style of education to a more patient-centered approach. Therapeutic patient-centered education has been promoted since the 1970s when Jean-Phillipe Assal first introduced the approach in the treatment of diabetes including medical, psychological and educational care (Maldonato et al., 1995). Since then, various learning and behavior theories (e.g. health belief model, empowerment, self-efficacy, socio-behavioral model) have been tested and reported in the literature (Corabian & Harstall, 2001; Krichbaum et al., 2003; Funnell, 2004; Anderson et al., 2005).
Demonstrating comparative advantages of different education models, delivery modes, and settings is problematic due to inadequate description of interventions (Corabian & Harstall, 2001). This precludes reliable conclusions to which type of program or what components are most effective and lack of agreed goals and indicators (Muhlhauser & Berger, 2000; Eigenmann & Colagiuri, 2007). Evaluation is further complicated by factors such as the competence of the health care staff (Colagiuri et al., 1994) and it has, therefore, been difficult to determine the impact of educational interventions (Peeples et al., 2001).

### 1.5.4.1. Group Education and Individual Education

Systematic reviews have not demonstrated a significant difference in HbA1c levels between group and individual education (Gary et al., 2003; Norris et al., 2002a). Gary et al. (2003) conducted stratified analysis for pooled effect sizes for glycated haemoglobin based on method of delivery (individual vs group) and reported a similar effect sizes of -0.62% (p=0.005) and -0.70% (p=0.015), respectively for individual and group education. Norris et al (2002a) performed a meta-regression analysis, using the mean difference between intervention and control groups as dependent variables, to investigate treatment interactions of group vs. individual intervention presentation and found no significant interaction.

The systematic review by Norris et al. (2001) of the effectiveness of DSMT in Type 2 diabetes reported that lifestyle interventions were generally effective in group settings with positive outcomes on weight loss (noted in 9 studies) and glycaemic control (demonstrated in 5 studies). Both individual (evidence from 5 studies) and group lifestyle interventions (3 studies) have positive effects on diet and self-care behaviors and also seem equally effective for interventions that focus on knowledge and SMBG. Group programs are more cost-effective than individual education.
A systematic review by Deakin et al. (2005) found significant improvements in FBG levels, HbA$_{1c}$, diabetes knowledge, reduction in systolic BP levels, body weight and reduced requirements for diabetes medication in participants of group-based training compared with routine care. However, no direct comparison between group vs. individual was provided.

Another systematic review of provider-patient interaction included one RCT which demonstrated that group consultations over a two years period maintained stable diabetes control and improved blood lipids, BMI, diabetes health behavior, diabetes knowledge and QOL scores compared with individual consultations (van Dam et al., 2003).

A recent Cochrane review (Duke et al., 2009) evaluated the effectiveness of individual education on metabolic control, diabetes knowledge and psychosocial outcomes. Nine studies involving 1359 participants met the inclusion criteria. The authors identified six studies that compared individual face-to-face education to usual care. Individual education did not significantly improve glycaemic control - WMD in HbA$_{1c}$ -0.08% (95%CI -0.25 to 0.08, p=0.33) over a six to twelve month period. There was also no significant improvement in BMI, blood pressure or total cholesterol in the short (6-9 months) and medium term (12-18 months). However, a subgroup analysis of three studies involving participants with a baseline HbA$_{1c}$ greater than 8%, showed a significant benefit of individual education on glycaemic control (WMD -0.31% (95%CI -0.54 to -0.09, p=0.007). The authors also compared individual education with group education. Analysis of data from three studies did not demonstrate a significant difference in glycaemic control between group education
compared with individual education at 12 - 18 months with a WMD in HbA$_{1c}$ of 0.03% (95%CI -0.32 to 0.08, p=0.22). However, at 6 - 9 months, group education appeared to have a greater impact on glycaemic control than individual education, with a WMD in HbA$_{1c}$ of 0.81% (95%CI 0.34 to 1.29, p=0.0007). There was no significant difference in the effect of individual education compared with group education on BMI, systolic or diastolic BP. A qualitative review suggested no difference in QOL, self-management skills or knowledge between group and individual education. The authors concluded that this meta-analysis suggests a benefit of individual education on glycaemic control when compared with usual care in a subgroup of those with a baseline HbA$_{1c}$ greater than 8%.

A number of recent RCTs compared group education with standard care in people with Type 2 diabetes. Davies et al. (2008) evaluated the effectiveness of a structured group education program compared with usual care for established and newly diagnosed people with Type 2 diabetes (DESMOND). At 12 months, HbA$_{1c}$ levels had decreased by 1.49% in the intervention group compared with 1.21% in the control group. After adjusting for baseline and cluster, the difference was not significant: 0.05% (95%CI −0.10% to 0.20%). The intervention group showed a greater weight loss: −2.98 kg (95%CI −3.54 to −2.41) compared with 1.86 kg (95%CI −2.44 to −1.28) (p=0.027) in the control group at 12 months. Self-reported physical activity in the previous week was significantly increased at 4 months OR=2.17 (95%CI 1.01 to 4.66, p=0.046) but showed no significant difference at 8 and 12 months between intervention and control groups. The odds of not smoking were 3.56 (95%CI 1.11 to 11.45, p=0.033) higher in the intervention group at 12 months. The intervention group showed significantly greater beneficial changes in illness belief
scores (p=0.001) and a lower depression score at 12 months (mean difference $-0.50$, 95%CI $-0.96$ to $-0.04$, p=0.032). The authors conclude that structure group education programs that focus on behavior change can successfully engage participants in commencing additional effective lifestyle changes sustainable over 12 months.

Kulzer et al. (2007) assessed the efficacy of three education programs for people with type 2 diabetes - (A) a didactic-orientated group intervention focusing on the acquisition of knowledge, skills and information about the correct treatment of diabetes; (B) a self-management/empowerment group approach and focusing on emotional, cognitive and motivational processes of behavior change; (C) a combination of lessons in individual and group settings. Efficiency was measured at 3 (t1) and 15 months (t2) from baseline (t0). Results showed a fall in HbA$_{1c}$ in program B at 3 months which was sustained at 15 months. In program A, HbA$_{1c}$ was unchanged throughout (program A vs. B; p<0.05). With the more individualized approach of program C, there was a fall in HbA$_{1c}$ at 3 month, but this was not sustained at 15 months.

There were also significant benefits in program B subjects compared with treatment A in other medical (BMI and FBG), psychological (control, irritability and hunger dependency of eating behavior, and trait anxiety) and behavioral (exercise) variables. Adolfsson et al. (2007) evaluated the impact of empowerment group education on the confidence of people with Type 2 diabetes in diabetes knowledge, self-efficacy and satisfaction with daily life compared with the impact of routine diabetes care. The intervention group consisted of a 6 week empowerment group education program of two hours per week. The control group underwent the same
routine diabetes care in their primary care centre which included usual visits to their diabetes specialist and specialist nurse and also individual counseling and recommendations based on biochemical and SMBG tests. At 1-year follow-up, the level of confidence in diabetes knowledge was significantly higher in the intervention group than in the control group (p<0.012). However, no significant differences were found in self-efficacy and satisfaction with daily life. BMI and HbA1c were not significantly different in the groups at one year.

A 5-year RCT of continued education delivered by group (intervention) vs individual diabetes education (control) was conducted in a hospital diabetes care unit in Italy (Trento et al, 2004). Group sessions were held every three months with one or two physicians and an educator. The control group continued with traditional one-on-one consultation and education sessions. Results showed an improvement in diabetes knowledge, problem solving ability and QOL at 5 years follow-up in the group care but worsened in the control group (p<0.001 for all). QOL improved from year 2 with group but worsened in the individual diabetes care group (p<0.001). HbA1c increased in the control group (+1.7%; 95% CI 1.1 to 2.2) over the 5 years but not in the intervention group (-0.1%; 95% CI -0.5 to 0.4; p<0.001). BMI decreased in the group program (-1.4; 95% CI -2.0 to -0.7, p=0.067) and HDL increased (+0.14mmol/L; 95% CI 0.07 to 0.22, NS) compared with the control group. The authors concluded that a traditional one-on-one care including consultation and education sessions is associated with progressive deterioration of knowledge, problem solving ability and QOL.

Educational procedures delivered in a group setting and tailored to participants’ needs can improve knowledge, glycaemic control and behavior (Trento et al, 2004).
1.5.4.2. Duration of intervention and length of session

In their systematic review, Norris et al. (2001) examined the effectiveness of DSMT in Type 2 diabetes. The 72 studies identified in this review ranged from one hour individual education to a twelve month intervention. The authors found positive effects of DSMT on frequency and accuracy of SMBG, self-reported dietary habits and glycaemic control in interventions of less than 6 months follow-up (Norris et al, 2001). In interventions with longer follow-up, regular reinforcement was required to produce these outcomes.

A systematic review by (Loveman et al., 2008) revealed that in general the educational programs that affected diabetes control were those delivered over longer intervals with a shorter duration between the end of the intervention and the follow-up evaluation point, although they found few interventions that did result in long-lasting effects on HbA\textsubscript{1c} despite longer intervals between the last point of contact with the educators and the point of outcome measurement. It was noted that interventions varied considerably in whether sessions were provided over a short interval or spaced out over time. In one of the longest studies, the interventions were spread throughout a 4-year period but the timing varied among patients, while the briefest interventions lasted for 1 month.

Further evidence suggest that intensive education programs, with increased contact time between patient and healthcare provider may be more effective (Loveman et al., 2008; Conn et al., 2007; Bazian Ltd, 2005; Norris et al., 2002a). Loveman et al. (2008) included 13 studies in their review with considerable variation in the number of hours of contact between the patients and providers for each
intervention. This ranged from approximately 2.5 hours (in a 6-month intervention) to 52 hours (1-year intervention in two studies). Some interventions began with 2–4 intensive sessions of 90–120 minutes followed up with additional sessions at 3 and 6 months.

A review by Bazian Ltd (2005) concluded that increased contact time between patient and healthcare provider may be more effective than a one-off, home-based education session to prevent foot ulcers in people with diabetes. This evidence was highlighted also by Norris et al. (2002a) who showed increased contact time improved the effect of DSMT on glycaemic control. HbA\textsubscript{1c} decreased more with additional contact time between patient and educator, with a 1% decrease for every additional 23.6h (13.3-105.4) of contact. Total contact time was reported in addition to the number of contacts in 15 studies, with a total of 21 HbA\textsubscript{1c} measurements.

A review by Conn et al. (2007) showed a weak relation between the number of weeks intervention and favorable metabolic outcomes for two group comparisons. The number of weeks intervention was weakly related to metabolic outcomes for two group comparisons ($\beta_1=0.168$ in terms of log (days) such that the predicted mean effect size increased with increasing duration of intervention. For example, a tenfold increase in intervention duration increased the predicted mean effect size by 0.168; doubling it increased predicted mean effect size by $0.168\times\log2=0.051$. However, duration per session was not significantly related to outcomes. Other systematic reviews could not detect statistically significant associations between reduction in HbA\textsubscript{1c} level and attributes such as duration and intensity of interventions (Deakin et al., 2005; Sigurdardottir et al., 2007).
Duration of the program does not appear to alter the effectiveness of the education as was concluded by Deakin et al. (2005). A subgroup analysis showed that the least intensive group education programs, delivered in two RCTs, incorporated only three to four hours of education during the first year had similar results with regard to HbA1c as those resulting from the most intensive program that delivered 52 hours of education and support in the same time period. No actual results were presented for this sub-analysis. Deakin et al. (2005) did however observe that providing additional education sessions on an annual basis can result in long-lasting benefits to health and psychosocial outcomes. They further proposed that thorough analysis of educational concepts and methods for evaluation of qualitative analysis may be warranted.

1.5.4.3. Group size

Two of the studies included in the systematic review by Deakin et al. (2005) had larger groups comprising between 16 and 18 participants (and some cares) in each diabetes education program. A subgroup analysis did not show reduced effectiveness of the intervention with studies of large groups.

1.6. Significance of the study

- Research on the Effect of Diabetes Patient Education on Anxiety, Depression, and Perceived Stress is still scarce.
- Unfortunately, most of the diabetic patients do not have awareness about their disease, and they do not register themselves at the diabetes associations and clinics for Patient Education. The aim of this study is to show the importance of educating the diabetes patients of Type 2 who are suffering from Anxiety, Depression and Perceived Stress.
• Due to increase in Anxiety, Depression and Perceived stress, there will be a decrease in the quality of life in diabetic patients, hence the aim of this study is to show the importance of Diabetes Education on Anxiety, Depression and Perceived Stress for those with Type 2 diabetes.

• Most of the prior research has focused on physical aspects of effect of Diabetes Patient Education on diabetics, but there are a few researches on psychological problems.

• Most of researches in this area have been done in Western countries, but no research in Asian countries.