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Diabetes has reached every hook and corner of the world with its deep rooted health problems. There are different ways to look at the problems of diabetes. When we view the problem with an epidemiological dimension, Type 2 diabetes is a global epidemic. In the health care sector, diabetes is a costly health care problem. To health care team, diabetes is a multisystem involved complex metabolic disorder. For people, with holistic view, diabetes is an imbalance between mind, body, and spirit. Above all, for people living with diabetes, it is a persistent state that threatens their future. While the aim of the study is to explore the efficacy of raw diet and yoga to control Type 2 diabetes. It is important to review what is known about type2 diabetes, yoga and raw diet from other perspectives. Understanding what is known and not known high lights the significance of the study objectives and sets the context for the study findings. This chapter is divided into two parts. The first part focuses on diabetes mellitus, diet and yoga. Second part includes the studies related to diabetes Prevalence, risk factors of diabetes, diabetes and yoga, diabetes and diet, diabetes and quality of life, yoga and sleep, yoga and mental health, diabetes complications, morbidity and mortality due to diabetes and prevention.

2.1. THEORETICAL OVERVIEW

2.1.1 DIABETES MELLITUS

Normal Glucose Homeostasis

In the post absorption state, the major share of body glucose transfer happen in insulin dependent tissues. More or less half of all glucose utilization happens in the
cerebrum, insulin dependent tissue. Half of all glucose use happens in the brain and gets to be soaked at plasma glucose coverage of 40 mg/dl. An alternate 25% of glucose transfer happens in the liver in addition to gastrointestinal tissues. More or less 2.0 mg/kg/mt of normal sugar utilization definitely coordinated by the speed of endogenous glucose generation. Roughly liver generates 85% of sugar; remaining 15% is generated by kidney. Conversion of glycogen to glucose and formation of glycogen from no carbohydrate sources like amino or fatty acids depend on the generation of sugar by the liver. After sugar or food intake, blood sugar focuses on insulin discharge. Increased amount of insulin and sugar in the blood empowers glucose uptake by liver and peripheral tissues and depresses the hepatic glucose generation. The Muscle tissues are taking the greater part (85%) of sugar uptake and remaining 5% by fat tissues. Just a little measure of aggregate body glucose transfer, takes place by fat tissues. It assumes an imperative part in the upkeep of aggregate blood sugar level. Insulin is a powerful hormone, which prevent breakdown of fat. Changes in the blood free fatty acids, insulin and glucose assume a vital part in the support of typical glucose homeostasis. Glucagon assumes a focal part in the regulation of glucose homeostasis. After a normal meal, glucagon discharge is restrained by hyperinsulinemia, and the resultant hypoglucagonemia. This suppresses glucose production by liver and supports ordinary postprandial glucose resistance (Bays, Mandarino, & DeFronzo, 2004).

**Importance of sugar control**

During the fasting time, insulin level will be decreased and glucagon production is stimulated. This helps to maintain normal blood sugar level. Hepatic cells have an important role in producing and maintaining the sugar from the proteins. Furthermore, glucose uptake by the muscle tissues is decreased because of decreased insulin level.
After food intake, we can observe two stages of insulin production. In the initial stage, there will be a little blast of insulin discharge after food consumption or an increment in blood glucose storage and diminished glucose level after two hours of meal. Later, in the second stage of insulin production, insulin discharge will be specifically corresponding to the blood sugar rise. Because of this two stage production of insulin; glucose will be converted to glycogen and fat and stored in liver and muscle tissues as triglycerides (Gastaldelli, 2009).

**Prediabetes**

(Boada & Moreno, 2013) revealed that Plasma sugar level is increased in prediabetic condition. Prediabetes, otherwise called Dysglycemia, typically have no side effects. Individuals may have this condition for quite a long while without perceiving anything physically. Altered fasting glucose and impaired glucose tolerance can be seen in prediabetes. This depends upon the test and timing (fasting versus postprandial) utilized for interpretation. Impaired fasting glucose is currently characterized by an elevated Fasting Plasma Glucose between 100-126mg/dl. Impaired glucose tolerance is characterized by an increased blood sugar more than140mg/dl.

**Pathophysiology of Prediabetes**

Beta cell dysfunction and chronic low beta cell mass leads to reduced hepatic insulin sensitivity and impaired GLP-1 production and inappropriately increased glucagon production prediabetes can be presented alone with impaired glucose tolerance characterized by decreased insulin sensitivity to muscle tissues and reduced second phase insulin secretion. This will progress to peripheral and hepatic insulin sensitivity and gradual depletion of pancreatic beta cell capacity and development of prediabetes.
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Reasons for fat deposition in the gut

Tension and anxiety

a) Increased food intake  b) Smoking

c) Alcoholism

d) Hormonal abnormalities especially stress hormone  e) Special affinity to sugar

Decreased physical activity

Hereditary

Ageing

According to Gastaldelli (2009) Glucose homeostasis in Type 2 diabetes mellitus as follows

- Altered insulin secretion
- Decreased insulin sensitivity
- Impaired glucose uptake

Aetiopathogenesis Type 2 Diabetes Mellitus (T2DM).

Chugh (2007) said that the pathogenesis of Type 2 diabetes is still difficult to find. It is neither HLA linked nor there is any evidence of autoimmunity or viruses playing a role in its aetiopathogenesis. Various factors play a role in the pathogenesis are as follows:

1. Genetics

Monozygotic twins in Type 2 only indicates that genetics influence is powerful in Type 2 DM. Molecular studies revealed single gene defect in maturity onset diabetes of young (MODY) with variable presentation. T2 DM have two basic physiological defects:
A. Abnormal insulin secretion

This is a primary and basic defect responsible for development of diabetes. This defect is genetically determined (chromosome no. 11).

B. Insulin resistance

Insulin resistance is related not only to Type 2 diabetes but is also seen independently in obesity, hypertension, and hyperlipidaemia. From these findings, it appears that Type 2 is polygenic, each component being represented by a separate gene which gets expressed during life at different stages with interaction of environmental factors or change in life styles. Only presence of insulin resistance does not mean diabetes, however, abnormal insulin secretion is essential to produce diabetes. It has been hypothesized that diabetes is due to a combination of major and minor genes affecting insulin secretion, action, and obesity. Type 2 Diabetes, occurs in obese and nonobese individuals. It is due to three factors: 1. Abnormal insulin Molecule; 2. An excess of circulating insulin antagonists; 3. Target tissue defect either at receptor or post receptor level. This is the common cause of insulin resistance.

2. Pancreatic beta cell failure

In Type 2 DM, there is reduction of pancreatic beta cell mass with reduction in insulin levels. When beta cells are reduced by 20-30%, the uninvolved alpha cells produce glucagon and leads to hyperglycemia. Insulin resistance, an inherited defect in Type 2 DM, tends to raise blood sugar by stimulating insulin secretion and thus results in hyperinsulinaemia. When maximal insulin secretion capacity has been exceeded, any further rise in fasting blood sugar causes decline in insulin generation.
Causes of Insulin Resistance

Causes of Insulin Resistance are reported by Ozougwu, Obimba, Belonwu and Unakalamba (2013) were:

- Increased body weight
- Prolonged use of steroids
- Hormonal abnormality - reproductive system physiological changes during pregnancy
- Fatty liver
- Insulin receptor abnormalities
- Genetic abnormalities
- Genetic obesity (e.g., melanocortin receptor mutations)

3. Environmental factors

Epidemiological data reveals that physical inactivity and obesity act as diabetogenic factors only in those patients who are genetically susceptible to develop Type 2 diabetes.

4. Age

The occurrence of Type2 diabetes after 40 years of age indicates the age as an important risk factor.

Path physiology of Diabetes Mellitus

Insulin is a hormone which affects all the constituents of food like carbohydrates, fats, proteins, and electrolytes. Hyperglycemia, a characteristic feature of diabetes, occurs due to lack of insulin resulting in:
1) Poor glucose removal (utilization by the peripheral tissues).

2) Increased hepatic output of glucose into the circulation.

Consequences of hyperglycemia are: glycosuria, osmotic diuresis resulting in salt and water loss; glycosuria appears when blood glucose rises above the renal threshold for glucose (180mg %). As a result of hyperglycaemia and glycosuria, there is increased osmotic diuresis with resultant loss of sodium and water which explains obligatory polyuria and polydipsia of diabetes. Increased caloric loss results in compensatory polyphagia. Due to increased catabolism of glycogen and proteins into glucose, nitrogen, water, and electrolytes are released into extracellular space and then into urine which explains net loss of potassium, sodium, and phosphate in the urine during acute metabolic decompensation. The deficiency of insulin is directly proportional to the degree of lipolysis. There is a stepwise breakdown of fatty acids in the liver and it finally reduces to form ketone bodies. Ketone bodies remove water from the cells producing cellular dehydration.

**Glucose Homeostasis and Diabetes Mellitus (Criteria for the diagnosis of diabetes mellitus)**

Fauci, et al. (2008) reported the main criteria for the diagnosis of prediabetes and Type2 diabetes mellitus as follows:

Fasting blood sugar (FBS) 100mg/dl and 2h FPG 140mg/dl. Prediabetes: FPG: 100-125mg/dl and 2h FPG 140-199mg/dl. Diabetes Mellitus: FPG: 126mg/dl and 2h FPG 200mg/dl.

**Possibilities for the Development of Type 2 Diabetes Mellitus**

Type 2 Diabetic patients will present the history of parent or sibling with
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Type 2 Diabetes

Obesity

Inadequate exercise and physical activity

Asian, African, American, and Latino

Previously identified IFG or IGT

History of diabetes in pregnancy

History of Birth weight of child more than four kg

Increased BP, more than 140/90 mm Hg

Lipid profile abnormalities HDL < 35mg/dl, and TG >250mg/dl

Polycystic ovary disease


Main clinical indicators of Type 2 diabetes mellitus

Usually begins after 30 years

Body mass - Obese

Plasma insulin - Normal to high initially

Plasma glucagon - Elevated

Blood sugar Elevated

Decreased Insulin Sensitivity

Management - Weight loss and drugs
2.1.2 DIET

Perrin (2007) clarified that the key rational for consuming a routine of raw food diet is that nutrients are not destroyed while eating raw. When we heat the food beyond 105 degree centigrade, natural substances and enzymes get destroyed in the cooking process. The body’s proteins are then expected to process and metabolize substance that are enzyme drained through warming and cooking, thus there are less enzymes left for the body to absorb. Enzymes are the key to all main functions of the body, and they exist in the body in a small quantity. In the long win, these cycles leads to decreased wellbeing and at last, bring infection and diseases.

Current WHO and ADA Recommendations

Carter, Khunti and Davies, (2012) reported that it has been generally acknowledged that obesity is the most risky variable for T2DM; Being overweight, having abdominal fat, and obesity represent around 90% of all T2DM cases. There is a need to keep up a solid weight (BMI <25 kg/m2) or for those overweight to lessen weight to counteract T2DM. Physical movement has additionally been distinguished as a factor to identify the danger in developing T2DM. The ADA recommends that those who create life style change programs for individuals in danger of T2DM ought to suggest diminishing dietary fat and increased physical activity to decrease weight.

Those in danger of T2DM should consume high fiber diet with 1000 kcal. The WHO claims that the main proof for the dietary anticipation of T2DM is weight reduction. (Sinha, Anderson, Donald & Greenwald, 2003) reported the Indian Council of Medical Research (ICMR) has provided data on nourishing necessities particular for the Indian population. The most recent overview, finished in 2000 found that the Indian eating pattern and supplement intake has scarcely changed in the last 20 years. The
National Institute of Nutrition (NIN) prescribes an eating habit that incorporated high intake of fresh vegetables and fruits in required quantity.

**Diabetic Food**

Jeevani (2011) revealed that eating right is important if one is attempting to control diabetes. Though exercise is additionally essential, yet what an individual consumes is more vital for weight reduction. A diabetes eating regimen is essentially a solid consuming arrangement that has increased nutrients, decreased fat, and a reasonable amount of calories. The main question that one needs to give careful consideration to is some nourishment decisions regarding carbohydrates (sugars).

Counteractive action and controlling diabetes doesn’t mean living in hardship. Its consuming right food and any individual can eat their most loved substances. One should not need to surrender sugar totally or leave to a lifetime of sound food and sugar counting. The most vital thing is to shed weight and one does not need to lose all the additional pounds to get the benefit. Losing only 5% to 10% of one’s aggregate weight can help them lower blood sugar, lipid profile and blood pressure.

**Carbohydrates**

Diabetics may be urged to diminish their intake of carbohydrates that have a high glycemic value. Carbohydrates have a major effect on glucose levels more than fats and proteins. In general, it is best to reduce very refined starches like white bread, pasta, and rice, and also candy, and snack food nourishments. There are high-fiber complex carbohydrates otherwise called moderate discharge carbohydrates. Moderate discharge carbohydrates help to keep glucose levels even on the grounds that are processed all the more gradually, consequently keeping body from delivering an excess
of insulin. They additionally give enduring vitality and help you stay longer. Different quantity and quality of carbohydrates may be consumed for this reason; the type of diet to be eaten and to be kept away from is the same for all. Low-carbohydrates consumes less calories in obese patients with Type 2 diabetes which appear appealing because of their antihyperglycemic impact. Carbohydrates diet with some caloric limitation in overweight individuals has an enduring impact on bodyweight and blood sugar restriction.

Vegetables

In today’s world people encouraged to eat plant based diet. Researchers investigated the preferences of diet for controlling Type 2 diabetes vegetables provide adequate vitamins, minerals, and fiber. They also supply less amount of carbohydrates. Vegetables add in peppers, carrots, chillies, cabbage, green beans, vegetable juices, broccoli and so on.

Fruits

Natural fruits products give carbohydrates, vitamins, minerals and fiber. Fruits, like figs, pomegranates, apples, grapes, orange and citrus natural products can be eaten. Consume fruits raw or as juice with no sugar included. Consume littler bits of natural fruits product. Entire natural fruit product is additionally filling and has more fiber. Spare high-sugar and high-fat organic product pastries, for example, peach shoemaker or cherry pie for exceptional events.

Nuts

Griel and Etherton (2006) suggested that tree nuts have an unsaturated fat profile that positively influences blood lipids and lipoproteins. Low immersed fat and
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Elevated unsaturated fat are present in tree nuts and are abundant in different supplements. A far-reaching database demonstrates that tree nuts decrease LDL cholesterol by 3 to 19% contrast to Western and low-fat eating diet. Nuts additionally contain numerous supplements and bioactive aggravates that seem to add to the ideal impacts on lipids and lipoproteins which incorporate plant sterols, dietary fiber and cancer prevention agents. Due to their extraordinary supplement profile, nuts can be a part of routine diet.

**Fats and Sweets**

Limit the quantity of sweets and fats intake. Fats and sweets are not as nutritious as different nourishments. Fats have a ton of calories. Sweets can be high in carbohydrates and fat. Some contain immersed fats, trans-fats and cholesterol that increase our danger of coronary illness. Restricting these substances will help to get more healthy and keep blood glucose and blood fats under control. Need to spread Health bits like oil, cream cheese, ice cream, cookies, syrups and so forth constitute risky for diabetic patients.

**Foods to be Avoided**

Sugar is an issue as it is addictive. So sugar and manufactured sweeteners, including honey can be proposed to cut down slowly. The other alternative is to stop it altogether. This will give withdrawal manifestations, much the same as ceasing some other addictive medication. Food with sugar substances with the exception of jam without sugar ought to be avoided. Salt is the most noteworthy guilty part for diabetes. Enough salt is present in vegetables in inorganic structure, so diminish the intake of inorganic salt. Excessive fat intake is unquestionably not a decent practice. Prohibit eating fried things pattern completely. However a little amount of oil to ingest fat-
solvent vitamins, particularly vitamin E can be consumed. Grains and substances produced using wheat, grain, corn, rice, bread, pasta, baked food, cakes, rolls, pies, breakfast cereals. Starchy vegetables like potatoes specifically ought to be minimized. Beans except for runner beans can be suggestible. Sweetened foods grown from the ground fat yogurts, cottage cheese in little amounts. Low fat curd can replace high fat cheese. Don’t have routine tea or decaffeinated drinks consistently. Be careful with industrially bundled nourishments quick substances like fast foods, snacks, fruit juices, as these are much higher in carbohydrates than fresh fruit.

Special Food for Diabetes

Bitter gourd is a Unique Food for Diabetes. It contains a high measurement of plant insulin. It brings down the glucose levels adequately and it can be tackled a standard premise. Fenugreek is the most well-known nourishment used to control diabetes. We can control diabetes if we drink overnight soaked a teaspoon full of these seeds with a glass of water every day. Glucoside a component of Italian blackberry does not allow the starch to be converted into sugar. Garlic, being rich in potassium, is helpful in lowering blood sugar level and also replacing potassium lost in urine. Zinc and sulphur components of insulin are also found in garlic. Due to the diuretic and digestive properties of onions, they are more useful to diabetics. Flaxseeds contain a rich source of omega 3 fatty acids, which helps in maintaining sensitivity of cell membrane facilitating insulin and thereby the uptake of glucose by the cells and thus helping to control diabetes. Apples, kidney beans, oats meal, soya beans etc contain soluble fibers. They help to control diabetes because they help in slow digestion and absorption of nutrients which in turn lead to slow and steady release of glucose. Excessive bile acids found in the intestinal tracts and which convert into blood
cholesterol, are soaked up by these fibers. These fibers also help Type 2 diabetes to achieve their weight loss goals by emptying their stomach and triggering satiety. Another method found useful by Type 2 diabetes to achieve weight loss goals is by using water extracts of cinnamon; they promote glucose metabolism reducing cholesterol in addition to emptying the stomach and triggering satiety. They have also been found to advance glucose digestion system thereby reducing cholesterol. Diabetes is also regularly linked to other health problems like heart diseases, diabetic retinopathy, immune suppression and renal problems. Antioxidants like vitamin C, E, selenium, Zinc and chromium can be consumed as they have been found to control sugar level. Lifestyle change projected to prevent Type 2 Diabetes have not just expanded fibre intake and decreased fat; they have additionally included suggestions to expand products of the soil consumption that is fruits and vegetable intake. A report unequivocally discovered green leafy vegetables to be defender against the development of Type 2 Diabetes.

Willett, Manson, and Liu (2002) observed long term intake of starches that are quickly retained as glucose may increase the danger of Type 2 diabetes has been a long-standing controversy. Two fundamental components have been theorized; one intervened by increase in insulin resistance and the other by pancreatic fatigue as an after effect of the expanded demand for insulin. A high intake of starches with a high glycemic load delivered more prominent insulin safety than did the admission of low glycemic carbohydrates. In planned epidemiologic studies, both the glycemic load and the glycemic burden (the glycemic record duplicated by the measure of carbohydrates) of the general eating pattern have been connected with a more serious danger of Type 2 diabetes. Alternately, a high intake of grain fiber has been reliably connected with lower
diabetes hazard. In diabetic patients, proof from medium-term studies recommends that supplanting high-glycemic starches with a low-glycemic starches will enhance glycemic control and, among persons treated with insulin, will diminish hypoglycemic incidents. These dietary changes, which can be made by replacing items made with white flour and potatoes with entire grain, insignificantly refined oat items, have additionally been connected with a lower danger of cardiovascular diseases and can be an appropriate component of recommendations for an overall healthy diet.

2.1.3 YOGA

Yoga is a holistic health system. To bring about physical and mental wellbeing, yoga has been described as an effective technique. Yoga, as an addition to healthy living, has enjoyed an amazing and qualitative growth, since its introduction into a fashionable culture. Yoga aims to achieve a union with the divine by incorporating mind control, healthy living. Aim of yoga is to realize top level of assimilation through the adaptation of mind, stable health, happiness, and improve the standard of life. Sharma and Gupta (2014) reported that the meaning of Yoga is union. This self-discipline methodology of group action brings the body, breath and mind into a comprehensive direction. Joining yoga integrates body, breath and mind to achieve the self discipline and spirituality. This combination of health and spirituality developed gradually over a period of 5000 years within the Indian tradition. Yoga begins the history of yoga traditions. Pattanjali, the writer of Sanskrit literature, was a well known yoga teacher and Hindu thinker. It was Vivekananda who introduced yoga into the western thought by the late nineteenth and early 20th centuries. The UN agency made oriental Hindu philosophy and thinking popular. Exercise of all types of muscles of the body that is skeletal, and internal organs with very little energy loss, is the basis of the
yogic system of health. All yogic practices are combined with each other to give a total psycho-neuro-physical impact. Yoga positions include the entire human body from head to toes. The first type of positions target specific muscles, nerves and activate brain cells. The second type includes positions used for meditation, relaxation and pranayam practices. Daily practices of these positions can be used to heal general and bodily irregularities. Cardiovascular diseases, Obesity, and diabetes are caused by psychological stress and faulty lifestyles. Yoga starts working from the structural level of the body helping to bring about a balance of the body systems. However the above results are an exaggeration of the benefits of yoga on the mental emotional and general well being as well as the active functioning of the neurological mechanism to gain health benefits.

Srivastava, Shipra Srivastava and Ahuja (2014) outlined that twists within the body offer blood and oxygen to organs increasing functioning and wellbeing of those organs. These yoga exercises once practiced with respiratory exercises and meditation it enhance digestion and facilitate pancreas and liver function in a better Way and regulate blood sugar levels. Some helpful postures in diabetes include: Dhanurasana (Bow pose), Ardhamatsyendrasana (Half spinal twist), Matsyendrasana, Gomukhasana (Cow Face Pose), Vajrasana. Besides the advantages of accelerating lean body mass and transportation of body fat, there is up regulation of endocrine receptors and improved endocrine sensitivity and decreased endocrine resistance. Yoga postures are excellent exercise for diabetic patients as they improve blood supply in different parts of body.

The following step depicts the sequence of yoga. Learning and practicing of yogic exercise

Practice on an exercise mat in a clean and well ventilated room
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Practice on an empty stomach wearing clean simple clothes in a peaceful surrounding

Practice all exercise slowly, gently, smoothly without exhausting oneself. Ideal time for practice is daybreak i.e. in the morning or at dawn

Practices everyday for one hour at the same time and place.

2.2. STUDIES RELATED TO DIABETES

2.2.1 INCIDENCE AND PREVALENCE OF DIABETES

Global prevalence

An estimate of how widespread diabetes would be in the year 2000 and 2030 has been projected by Wild, Roglic, Green, Sicree and King (2011). The worldwide prevalence of diabetes in adults is anticipated to extend from 5.9% to 7.1% from 2007 to 2025, or from 246 million to 380 million individuals. The amount of adults with diabetes is anticipated to achieve seventy million in India and fifty nine million in China by 2025. India has reached epidemic proportions. Globally > one hundred fifty million individuals have diabetes.

Wild, et al. (2004) explored that about 2.8% of the world population in 2000 and 4.4% of the world population in 2030 belonging to all age groups would be suffering from diabetes. More men than women will have diabetes. Diabetes among the urban population of the developing countries is projected to double between 2000 and 2030. Considering the increasing problem of obesity, it is probable that the above estimates are much lower than the actual figures of the future.

According to National diabetes fact Sheet 2011, Centers for Disease Control and Prevention (CDC) reported that 10.9 million (26.9%) US individuals who were 65 years and above suffered from diabetes in 2010. Also nearly 215,000 individuals less
than 20 years had diabetes either of type one or two in 2010 in the US. Recently in 2010 in the US about 1.9 million individuals above the age of 20 were diagnosed with diabetes. On the basis of fasting glucose or hemoglobin levels about 35% of adults above 20 years had prediabetes, between the year 2005 -2008, of which 50% were above 65 years. This percentage when converted into actual figures about 79 million individuals above 20 years had prediabetes in 2010.

A gender based study shows that 9.8% of males and 9.2% of women had prediabetes in 2008. This was an increase from 8.3% and 7.5% respectively in 1980. In other words the number of individuals with diabetes had increased from 153 million in 1980 to 347 million in 2008. Oceania had the biggest rise with 15.51%, for men; and 15.9%, for women being diabetic in 2008. It was also high in south Asian, Latin American, the Caribbean, the central Asia, North Africa, and the middle east. In 2008 the mean FPG was the lowest in sub-Sahara, Africa, east and Southeast Asia and high income Asia Pacific. Stevens, et al.(2008).

During this junction Mohan (2004) says that diabetes, which has become a public health problem the world over, is rising the status of a deadly disease so much so that by 2025 almost all non individual countries of Asia and China alone will have about thrice quarter’s of the world’s 3000 million adult population will be diabetic.

**National prevalence**

According to Joshi and Parikh (2007) reported that India has the position of being the diabetes capital of the world with 41 million Indian being diabetic, that is every fifth diabetic in the world is an Indian. 20 million Indians are either fat or abdominally obese by 2025; the expected number is 68 million. Kutty and Raju
(2010) declares that the emergence of Type 2 diabetes in kids and youth has transformed diabetes into an epidemic that is spreading very rapidly across the globe. It is estimated that currently about 30 million are diabetes which could rise to be about 60 million in 2017. Mohan, Sandeep, Deepa, Shahamp and Varghese (2007) say that the international diabetes Federation through the diabetes atlas 2006 reveals that in India the number of individuals with diabetes is about 14.9 million which is expected to rise to 69.9 million by 2025: If preventive steps are not taken urgently. The spread of diabetes among the rural folk of Sonapet district of Hariana was estimated by Madaan ,et al. (2014). Genderwise 19.36% males and 16.98% females were diabetes. Diabetes was found to be most (41.96%) among the age group 46-60 years. Mohan, et al. (2007) has noted that in India, Diabetes Mellitus is considered as a serious disease not only because it is spreading rapidly but also because it spreading rapidly among the young and the middle aged population. DM would also increased the disease burden and socio economic pressure in the productive population and health systems within the country.

Anjana et al. (2011) says that different studies various types of detailed investigation and analysis has been conducted to estimate the spread of DM among the urban population in India. However, the availability of information on DM among the rural population is very scarce in fact. Anjana et al. even have observed with concern that the coverage of the Indian rural population the various national studies are poor. The Census of India (2013) reported that close to 742 million people that is 70% of population India lives in rural areas. Therefore it becomes essential to estimate the spread of diabetes among rural Indian population in order to design ways to light the battle against DM.
Mohan et al. (2008) found that the number of individuals with Type 2 Diabetes among the urban population is 20.1/1000 persons per year, while the figures for pre Type 2 Diabetes is 13.1/1000 person per year. Type 2 Diabetes among those individuals with impaired glucose tolerance (IGT) at baseline was higher compared to individuals with normal glucose tolerance (NGT). This research team has declared that the Indian diabetes risk score (IDRS) was the best predictive tool for estimating the frequency rate of Type 2 Diabetes in Asian Indians.

Gupta and Misra (2007) done a regional disparities studies of diabetes in India between 1960’s and 1970’s. It has been found that diabetes varied from 1-4% among urban and 1-2% among rural population. However, studies since 1990’s puts the variation to 5-15 % among urban and 4-6% among semi-urban population. 2–5% in rural populations 5.4% in an exceedingly northern state 12.3–15.5% in urban center, South India, 12.3–16.8% in Jaipur, Central India.

**State prevalence**

Vijayakumar, Arun and Kutty (2009) estimated the prevalence of DM and impaired fasting glycaemia (IFG), in rural Kerala in 2007. The study was conducted among 1990 adults (1149 women and 841 men) of panchayat wards in Venmony Panchayat of chengannur taluk in Kerala and the response rate was found to be 82.7%. The rough and age related spread of DM in the 2 Panchayats was 14.6% and 12.5% respectively while it was found to be 5.1% and 4.6% respectively. These figures prove the spread of DM among the rural population the world around.

According to Anjana et al. (2011) the world diabetes atlas has declared that India posses around 51 million individuals with DM and impaired fasting blood glucose (IFG). Impact of socioeconomic transition on the prevalence of DM has to be
explored additional. Mohan, et al. (2007) highlighted the epidemiology of diabetes in numerous regions of India, in keeping with UN agencies criteria was 5.6% for the urban and 2.7% for the rural areas. In south regions of India the spread has been reported to vary between 0.7% in Pondicherry to 19.5% in urban areas. Whereas the spread was between 1.3% in Thiruvananthapuram to 13.2% in Gothavary in rural areas.

As seen, throughout India, the prevalence of diabetes is lower in rural areas, however, the speed will increase considerably from rural to peri-urban and better in urban areas. Vijayakumar, et al.(2009) carried out a study to seek out the occurrence of Type 2 Diabetes in countryside of middle part of Kerala, in two wards of the Venmony panchayet in Chengannur taluk, Alappuzha district of Kerala. India shelters the foremost variety of individuals with Diabetes globally. Spread of Type 2 Diabetes and other metabolic disorders in rural central Kerala in the year 2000 about 30 million individuals were found to suffer from Diabetes. Further, it was estimated that there would be a 2.5 fold increase over the next 30 years. So that 2030 an alarming 80 million individuals would be diabetes.

<table>
<thead>
<tr>
<th>Country</th>
<th>Year 2000</th>
<th>Year 2030</th>
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<tbody>
<tr>
<td>India</td>
<td>31.71 million</td>
<td>79.4 million</td>
</tr>
<tr>
<td>China</td>
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<td>42.3 million</td>
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<tr>
<td>Pakistan</td>
<td>5.2 million</td>
<td>13.9 million</td>
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</tbody>
</table>
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Figure 1: Global Prevalence of Type 2 Diabetes Mellitus (Wild et al. 2011).

Figure 2: Prevalence of Type 2 Diabetes Mellitus in urban India (Wild et al. 2011).
2.2.2 RISK FACTORS OF DIABETES

It is important to think aloud the main causes of diabetes because the understanding and insight about precipitating factors and root cause of the disease...
condition helps to take remedial steps to prevent the disease condition in more fruitful manner. Hu. (2011) reported that Type 2 diabetes is fueled by rapid urbanization, nutrition transition and increasingly sedentary life styles, wide spread habit of smoking, high consumption of alcohol, large intake of refined carbohydrates such as white rice, consumption of food low in nutritive value during pregnancy and in early life and in contrast having over nutritious food in later life, all these play a big role in spreading Diabetes. In fact diabetes has spread in direct proportion to the increased in obesity.

The known risk factors of Type 2 Diabetes embedded in nature (genetic) as well as nurture (intrauterine environment). Rao, Kamath, Shetty and Kamath (2011) reported that one of the major risk factors of diabetes is obesity. Indians have a lower overweight and obesity rates. Yet, when compared to western countries the spread of diabetes is higer in India. This suggest that even Indian’s with lower body mass index may be prone to diabetes. These finding was supported by Mohan and Deepa (2006) observations: that Indians who are lean and have a lower BMI are also are equal risk as those who are obese.

Kutty and Raju (2010) declare that though high per capita income, socioeconomic status of persons, increasing life expectancy and urbanization are the signs of growth and development yet the changes in lifestyle, food habits, sedentary lifestyle, mental stress all these lead to diabetes and its complications. The additional burden of decreasing cognitive abilities is taking a huge toll of human resource utilization. It is believed that DM is the single most important bodily disorder that can affect every organ system in the body.

Mohan, Sandeep, Deepa, Shah and Varghese (2007) pointed out that among Asian Phenotype India leads the way. This phenotype covers a wide range of
characteristics like increased resistance to insulin, abdominal adiposity, wider waist circumference, in spite a lower BMI, lower adiponectin and greater high sensitive C-reactive protein levels. This phenotype can lead Asian Indians to become diabetes and more prone to premature coronary artery diseases. A major cause of this can be attributed to genetic factors. However, the major cause of the spread of diabetes on an epidemic level are the changes caused by the changes in food habits and reduced physical activities which is proved by the increasing spread of diabetes among the urban population.

2.2.3 YOGA AND DIABETES

Yoga, which is an ancient Indian science comprises of stress reducing techniques that include regular breathing, visual imagery, meditations as well as different types of positions. The authors studied the impact of ‘Tibetan’ yoga practices of Tsi Jung and Trul Khor on patients with lymphoma. Tibetan yoga also comprises controlled breathing, visualization mindful techniques and low impact postures. Thirty nine lymphoma patients who were either undergoing treatment or who had concluded treatment with in the past 12 months were assigned to a T,Y group or wait list control group. The study observed that stress reducing programmes that were designed for cancer patients helped them to cope up with the effects of treatment and improved the quality of life.

Yoga is an ancient science and a rich cultural heritage of India. Many earlier books cite the usefulness of yoga in treatment of certain diseases as well as to maintain normal health in individuals. However, a detailed examination of the effect of yogic practices on the management of diabetes has not been done. To assess the role of yogic practices on glycemic control, insulin kinetics, body composition, exercise and aspects
like hypertension and dyslipidemia in normal individuals and diabetes. Both short term and long term studies were conducted. These studies prove the useful role of yoga in controlling diabetes mellitus. In fact there was a considerable reduction in the fasting and the postprandial blood glucose levels (Sahay, 2007).

A good glycemic level can be maintained and that too for long periods of time. Not only was that but there a reduction in the drug requirement and other complications like infection and ketoses. The change in insulin kinetics counter regulatory hormones like cortisol was significant. There was also a reduction in free fatty acids body fat percentage though there was an increase lean body mass. There was an increase in insulin receptors, improvement in insulin sensitivity and decline in insulin resistance. Thus it could be proved that yogic practices do have a role in preventing diabetes. Not only that yogic practices were even beneficial on co morbid disorders like increased BP and dyslipidemia.

Bindra, Nair and Darotiya (2013) assessed whether Blood glucose, lipid profile and HbA1c in Type 2 diabetes patients could be affected by pranayams and yogic positions. 100 patients of Type 2 diabetes mellitus who didn’t have any other disorders and aged between 35 and 65 were divided into two groups. Group I was administered only conventional medicine, while group two patients practiced yoga for 90 days along with conventional medicines. Their blood glucose, lipid profile and HbA1c were recorded before and after the 90 days. The result showed that patients of group two showed a greater control on diabetes markers like blood glucose, cholestrol, LDL and HbA1c levels and a marked improvement in HDL levels than group one except TG in group two patients. Group one patients showed an insignificant improvement, thus, proving the beneficial effects on yoga on the parameters of diabetes.
Gordon et al. (2008) compared the difference in the effects of Hatha yoga and conventional physical training (PT) exercise regimens on the biochemical status of patients with Type 2 diabetes mellitus. The study considered 77 Type 2 diabetes patients under the Hatha yoga exercise regimen and an equal number under patient regimen. Biochemical parameters like fasting blood glucose, serum total cholesterol, triglycerides, low density lipoproteins were recorded at base time and at two consecutive three monthly intervals. The results obtained showed a decline in the concentration of FBS by 29.48% for patients under Hatha yoga exercise regimen and 27.43% decline for patients under PT exercise groups. There was also a marked reduction in the serum TC in both groups. After 6 months the concentrations of VLDL in the managed groups showed a significant difference from the baseline values. The study proved the benefits of Hatha yoga on fasting blood glucose, lipid profile, oxidative stress and antioxidant status of Type 2 diabetes patients. Therefore the study suggested that there are therapeutic, preventive and protective benefits of Hatha yoga regimen on diabetes.

The relation between the muscle strengthening activities with the risk of T2 diabetes in women were observed by Grontved et al.(2014). They studied 99,316 middle aged and older women for 8 years (2000-2008) from the nurses’ health study. These women were neither diabetes, cancer nor cardiovascular patients. The time these women spent weekly on resistance exercise (yoga), stretching toning, aerobic moderate and vigorous physical exercise at baseline were recorded. The pooled relative risk for Type 2 Diabetes for women practicing 1-29 minutes / week was 0.83%, 30-59 minutes / week was 0.93%, 60-150 minutes / week was 0.75% and 150 minutes /week was 0.60% compared to women who did no muscle strengthening and conditioning exercise. These
exercises were independently related to lower risk of Type 2 Diabetes in pooled analysis. Women who performed aerobics for a minimum of 150 minutes /week and muscle strengthening exercise for 60 minutes /week had a much lower risk of Type 2 Diabetes as compared to inactive women. Thus we can see that the risk of Type 2 Diabetes among middle aged and older women can be reduced by performing both aerobic as well as muscle strengthening exercise.

Hegde et al.(2011) have made a comparative study of the effects of yoga along with standard care and standard care alone on anthropometry, blood glucose, glycemic control and oxidative stress of 1233, Type 2 Diabetes patients were divided into groups with micro vascular complications, macro vascular complications, neuropathy and those without complications, who were assigned either yoga along with standard care or standard care alone. The result proved that there was a marked reduction in BMI glycemic control and increase in vitamin C for the group which did yoga along with standard care. However there was no change in waist circumference, waist hip ratio, blood pressure and vitamin E for the same group at follow up. Therefore we can see that yoga can help to bring about a reduction in BMI, oxidative stress, better glycemic control in Type 2 Diabetes patients.

Kelley and Paster (2001) revealed the usefulness of physical activity in the management and anticipation of Type 2 Diabetes Mellitus. Studies indicated that advanced levels of bodily movement evidently connected with a lesser occurrence of Type 2 Diabetes. However, a fewer number of evidence suggesting that escalating levels of bodily movement add to improved diabetes prevention. There is a need to do more and more studies to explore the link between prevention of diabetes with increasing physical activity.
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The risk profiles of patients with Type 2 Diabetes can be improved with yoga and in this way yoga can become the future promise for preventing and managing cardiovascular complication among the general population. Innes, Vincent and Taylor (2007) reviewed the Writings, books and journals which indicates the effectiveness of yoga on physiological and anthropometrical risk profiles and other related clinical results in Type 2 Diabetes adults. The search was restricted to original studies (1970-2006). The studies indicate a positive change in glucose tolerance, insulin sensitivity, lipid profiles, anthropometrical activation, pulmonary functions and other clinical results.

Rast, Hojjati and Shabani (2013) explored the impact of 8 weeks of yoga training on blood glucose and lipide profile in patients with Type 2 Diabetes. In this quasi experimental study, 30 women with Type 2 Diabetes and between 45 to 60 years old were participated as experimental and control groups. Experimental group were subjected to regular yoga, while the control group did not have any regular activity. The dependent variables were total cholesterol, (TC), triglycerides (TG), LDL, HDL, and plasma sugar. All variables were examined pre and post exercise training period. Outcome indicated a considerable difference in the total cholesterol, triglycerides, LDL, HDL and blood glucose between the control and experimental groups (p<0.05). Yoga is a non drug, non invasive and cost effective method to improve the quality of life. The effect of yoga on the mind and body and reducing stress hormones have been proved since long time. Therefore, it seems that patients with Type 2 Diabetes, along with full compliance with diet can be benefit these exercises in order to control some risk factors associated with diabetes.

Dubey, Mishra and Khare (2014) studied the result of six month of pranayama
training on T2 DM patient’s blood glucose and blood pressure. The group consisted of 50 known diabetic patients between the age of 35 and 65. They had to undergo yogic practice like Anulom, Vilom, Pranayams and Kapalbhati or 5 minutes each on a daily regimen or a total of 6 months. It was found that there was a considerable reduction in the patient’s blood sugar level from 174 +38.57 at their first visit to 154.83+ 24.579 after six months in both the gender. There was no significant change in blood pressure even after 6 months.

McDermott et al. (2014) carried out a study on a random sample of people at high to for diabetes, on the ability of yoga to reduce the risk factors. The sample consisted of 41 participants of which 20 were asked to attend yoga classes and the remaining 21 participants were asked to complete monitored walking 3-6 days a week for 8 weeks. The results showed a marked reduction on weight, waist circumference and BMI as compared to the other group. Not only that over the period of study both yoga in systolic diastolic blood pressure, total cholesterol, anxiety, depression and perceived stress. This result proved true even / or Indians with elevated fasting blood glucose. Thus yoga can be considered a promising therapy for reducing weight related Type 2 Diabetes.

Ezema et al. (2014) investigated a sample of Type 2 Diabetes patient’s blood glucose response to aerobic training type2 DM. A total of 54 subjects with T2DM (FBS 110-225mg/dl) were randomized into two age matched groups: exercise group and control group. The participants of the exercise group had to participate 8 weeks continuous training programme comprising of 45 to 60 min. session 3 times a week while the control group continued with their sedentary life. Systolic blood pressure (SBP), diastolic blood pressure(DBP), aerobic fitness (vO2 max) and FBS were
assessed. There was a significant effect of exercise training program on SBP (p=0.000), DBP (p=0.007), FBS(p=0.001) and VO2max(p=0.013). To conclude, it can be said that aerobic exercise training programme can be used as an effective additional supplement to controlling blood glucose levels among Type 2 diabetes patients. Cohen, Chang, Grady and Kanaya (2008) conducted a study to find out a restorative yoga intervention was possible and acceptable in inactive and overweight adults with metabolic syndrome. A random selection of 26 inactive and overweight adult men and women were made to attend 15 yoga sessions of 90 min. each for a period of 10 weeks. Calculation with regard to change in metabolic outcomes and questionnaire measures from baseline to the 10th week were made. The highest possible satisfaction rating was given by participants of the yoga group and 87% of them felt that positions were easy to do. The results showed a trend towards decreasing blood pressure and a greater increase in energy level as well as an overall improvement in general wellbeing compared to control group. There is a need to explore the ability to yoga to improve metabolic parameters in a larger randomized controlled trial.

A qualitative study was carried out by Alexander, Taylor, Innes, Kulbok and Selfe (2008) describing the personal experiences of 13 adult participants with or at risk for T2 DM with yoga and to explore their notions regarding maintenance of yoga practices over time. After 16 to 20 months after the completion of an 8 week yoga training trial semi-structured interviews were conducted. It revealed that even though yoga appealed to many diabetic individual, they found it a challenge to maintain yogic practices over time. Diabetic individuals who were interested in maintaining yoga could be helped by discussing specific strategies through diabetic education.

Butter (2008) conducted a smaller study of London yoga biomedical trust and
found that fasting blood glucose and HbA1c levels could be decreased with a 12 week yoga programme. A large sample of 2000 diabetes who had heart disease and who did yoga and made lifestyle changes for an year showed similar results after a 12 week and 1 year according to a much larger Medicare Demonstration project. Daily yoga classes can decrease fasting blood glucose, HbA1c, systolic and Diastolic BP.

Duraiswamy, Balasubrammaniam, Subbiah and Veeranki (2011) also reported the result of five weeks of yoga practice. A significant decrease in plasma glucose, serum cortisol and serum Malone-di-aldehyde (MDA) levels and a significant increase in serum super oxide dismutase (SOD) action were noted. Also, the effect of yogic intervention was discovered to be more proclaimed in subjects with poor glycemic control. Discoveries emphasize that the Sun Salutation and Nadishodhana Pranayama can be the alternative therapy in Type 2 Diabetic patients.

Yang et al. (2009) observations that after attending a 12-week yoga program among adults prone to develop Type 2 diabetes reported an good prognosis in body weight, blood pressure, insulin, triglycerides and implementation of physical activity. Along with this study findings Benavides and Caballero (2009) also claimed that there was an average weight loss of two kg after an effective yoga programme and low self-esteem and anxiety symptoms improved after yoga. (Barnard, et al. 2009 and McGrievy, et al. 2008) reported that 99 adults with Type2 diabetes practiced 22 weeks vegan diet with 75% carbohydrate, 15% protein, and 10% fat and the control group consumed 60-75% carbohydrate, 7% saturated fat and 15-20% multiunsaturated fatty acids (MUFA). Energy deficits of 500-1,000 kcal is maintained if body mass index is >25. Vegan group versus control group HbA1c reduction was r=0.34 and r=0.14; body weight reduction 4.4kg vs 3.0kg(P<0.001); TC reduction 20.4mg/dl vs
6.8% (P<0.01). After 22 weeks Alternate Healthy eating Index improved in vegans (P<0.001) and the control did not show the difference. At 74 weeks, 33 subjects from vegan group and 22 of control members from control group reported adherence to diet criteria (P<0.019).

Bijlani et al. (2005) carried out a study to find out short-range effect of lifestyle change and yoga on selected hematological markers of danger for cardiac illness and diabetes. The intervention comprised of asana, and group support with teaching on stress management, nutrition, and knowledge about the illness. Fasting blood sugar, Lipid profile (TC, LDL, VLDL, TG,) were reduced and HDL considerably elevated at the end of the intervention. Patients with increased blood glucose values and high cholesterol values were shown much better out come with the intervention.

Malhotra et al. (2005) additionally upheld discovery report that 40 days yoga asana (Pranayama, Surya Namaskar, Sukhasana, Padmasana, Trikonasana, Pashimottanasana, Bhujangasana, Ardhmatsyendrasana, Dhanurasana Pawanmuktasana, Vajrasana, and Shavasana) were given to 20 Type2 diabetes patients between 30 to 60 years age. The findings specify that there is a remarkable reduction in fasting blood sugar from 208.3 to 171.7mg/dl, blood sugar level after one hour food consumption were reduced from 295.3 to 269.7 mg/dl and additionally waist hip proportion were reduced remarkably.

Singh, Malhotra, Singh, Madhu and Tandon (2004) concentrated on the impact of 40 days Yoga practice on cardiovascular functions, blood sugar level and HbA1c. The subjects were 24 middle-aged Type 2 Diabetics on antihyperglycaemic and dietary regimen. Following 40 days of yoga asana regimen, the outcomes show that cardiovascular functions, (pulse rate reduction from 86.45 to 77.65/min, systolic blood
pressure from 142 to 126 mm of Hg, and diastolic blood pressure from 86.45 to 77.65 mm of Hg) blood sugar levels (fasting blood sugar reduction from 190.08 to 141.5 mg/dl, blood sugar level after one hour food consumption were reduced from 276.54 to 201.75 mg/dl) and HbA1c (from 9.03 to 7.83%) demonstrated a positive outcome with yoga practice.

In line with previous findings Amita, Prabhakar, Manoj, Harminder and Pavan (2009) assessed the impact of Yoga-Nidra on blood glucose level on Type 2 diabetic patients with hypoglycemic agents. Total patients were divided into two sectors, one with intervention and other group only with routine hypoglycemic tablets. Intervention group practiced yoga for 30 minutes every day for 90 days. After 30 days of intervention mean fasting blood sugar (P<0.0007) and post prandial blood sugar (P=0.02) values revealed a significant outcome in the yoga group compared to hypoglycemic agent alone group.

### 2.2.4 DIABETES AND RAW DIET

Diabetes has exploded greater part of areas in the world. Healthy intake, as a strategy for controlling diabetes. Fruits, vegetables, and dietary spices symbolize a hope that it is potentially very high, to limit damaging effects. They provide dietary substances like dietary fiber, vitamins, minerals, and so on, which are fundamental for a balanced diet. The food pattern has favorable effects on individual health, development and treatment of various diseases, and hence, promoting adherence to this pattern is of considerable importance to public health.

Vafa et al. (2011) estimated the efficacy of apple consumption on TC, HDL, LDL, VLDL on subjects with elevated lipid profile values. The subjects were having overweight and elevated cholesterol values. Random sampling method used to divide 26
males into experimental group and control group. Experimental group is eaten 300g apple every day during the study period. After eight weeks of study period all components of the lipid profile were checked. Triglyceride and very low density lipoprotein levels were given statistically significant results.

Saman, Rosita and Amin (2011) assessed the difference between raw and processed flak nut on different type of cholesterol values. This study carried out with the help of animal samples. 10%, 20%,30% flak nut either raw or heated were given to rats for thirty days. Increased HDL and reduced total cholesterol were observed in all groups, but LDL cholesterol reduction is seen only in 30% crude flak nut samples. The findings revealed that thirty days flak nut eating will bring down total cholesterol and elevate HDL in the plasma.

The connection between fresh vegetables intake and development of diabetes was observed among people from China by Zhou et al. (2011). They reported that male and female subjects between 35 and 74 years old were selected for study. Information was collected with the help of food consumption history questions. The result revealed that reported case of diabetes were less among women, who were taken vegetables approximately fourteen times in a week in comparison with seven times per week group. Vegetables taken as fresh has an impact on delaying the development of diabetes.

Almond is very rich in nutrients, which is very good for heart. It contains high amount of unsaturated fatty acids and very less amount of saturated fatty acids. The content of this seed is very rich in heart protective elements. The heart protective elements in the almond help to act on the main pathway of low density lipoprotein cholesterol. This will help to reduce the absorption and enhance the elimination of
bile and cholesterol, and higher up the LDLC reactions. Based on this understanding Berryman, Preston, Karmally, Deckelbaum and Etherton (2011) evaluated the impact of this nut intake on LDLC levels among unhealthy and healthy participants.

Prathapan, Fahad, Thomas, Philip and Raghu (2011) assessed two varieties, sprouted and non-sprouted Bengal gram (white coated and brown coated) extracts were assayed for the inhibition of alpha-glycosidase and amylase activity. Sprouting increased the inhibitory potential of Bengal gram against alpha glycosidase and amylase compared with the non-sprouted variety. The overall results suggest that increased antioxidant and inhibitory potential of a pouted Bengal gram against alpha glycosidase and amylase makes them desirable for dietary management and prevention of diabetes.

Shidfar et al. (2011) evaluated the effect of tomato intake on serum glucose, and blood pressure in Type2 diabetic patients. Thirty two Type 2 diabetic subjects taken 200 g fresh raw tomato every day. This continued for eight weeks. At the end of the study, blood sugar and blood pressure remarkably changed from the initial reading especially for systolic and diastolic. The P value shows highly significant for both variables (P=.0001). It will help to decrease the cardiac problems related to diabetes among Type 2 diabetic patients.

The effectiveness of high fiber diets in the treatment of diabetes mellitus was carried out by Miranda and Horwitz (1978) Fiber containing food was given to diabetic patients; diabetic patients who were on insulin were given 20 gm crude fiber for ten days. During this therapy symptoms related to decreased sugar were observed in rich fiber diet group. Body weight was same for both groups. The findings of the study reveals that fiber containing diet has an important role in reducing blood sugar level in
diabetic patients.

Factors affecting starch digestability and the glycemic response with legumes was assessed by Thorne, Thompson and Jenkins (1983) and discussed that large differences exist in the plasma sugar levels of participants. Participants were diabetic patients and nondiabetic subjects. Legumes contain a large amount of fiber and protein which is digested slowly. Because of slow digestion and interaction only low quantity of plasma sugar elevation was observed in both groups. Long term result is effective diabetic control.

Beneficial effect of glycemic index diet in Type 2 diabetes were assessed by Wolever et al.(1992). They conducted the study to evaluate the effect of low sugar containing and starchy food. Pre-weighed food was given to the subjects after the total calorie calculation. Two weeks of low sugar containing diet was given to the participants. After the intervention blood sugar value was 29% less compared to high sugar containing diet. It reveals that low sugar containing starchy food items are good for the management of diabetes. Consistent with this a cross sectional study was undertaken by Desmond et al.(1999) and investigated the possibility of developing diabetics in individuals on vegetables and fruits. Participants were 1122 in number. All had filled food frequency questionnaire. The report reveals that frequent consumption of fruits and vegetables reduced the risk of diabetes between the age groups of 40-64 years.

Effectiveness of a low fat vegan diet and ordinary diabetic food were compared by Barnard et al. (2009). Both group participants were diagnosed with Type 2 diabetes. They followed this particular type of diet for two and half months. Body
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weight, HbA1c, and total cholesterol showed a significant reduction in the values of vegan group.

Dimitrios and Andry (2014) examined the effects of grapefruit consumption in relation to drugs, obesity and cardiovascular risk factors. The review includes the most updated studies found in PubMed. Grapefruit juice is commonly not allowed to be used alongside with many drugs, naringin is the most important which can inhibit absorption of some drugs but more commonly 6,7-dihydroxybergamottin, which inhibits CYP3A4. Lately, grapefruit has been found both in rats and adults to reduce body weight, blood pressure, improve lipid and hepatic profile and decrease platelet aggregation.

Liu et al. (2014) conducted a study to screen strongly-antioxidant fruits and vegetables. They used 1,1-diphenyl-2-picrylhydrazyl (DPPH), ferric-reducing antioxidant potential (FRAP), 2,2’-azino-bis-3-ethylbenzthiazoline-6-sulphonic acid (ABTS) and total reducing power (TRP) assays to investigate antioxidant activities in 110 fruits and vegetables. To analyze the correlation between antioxidant capacities and main reducing substance contents, total phenolic, flavonoid and vitamin C contents were assessed. The results showed great variation in antioxidant activity, and fifteen fruits and vegetables possessed the strongest antioxidant capacities: hawthorn, jujube, lotus root, persimmon, red plum, black plum, chilli pep-per, star fruit, strawberry, blueberry, cherry, peach, pomegranate and great burdock. Total phenolic contents showed higher correlation with antioxidant capacity when using FRAP and TRP assays than when using the DPPH or ABTS assay. Phenolics and flavonoids, rather than vitamin C, contributed to antioxidant potential in most fruits and vegetables.
2.2.5 DIABETES AND QUALITY OF LIFE

The most popularly used additional and alternative medicine therapies to manage illness is yoga in chronically ill patients. Practicing yoga under normal circumstances helps to improve the physical health, Quality of life of Type 2 diabetes patients. Those having chronic disease and who were expected to develop other diabetes related disorders were likely to have sum optimal physical and mental functioning. The notion of diabetes as a health threat along with having known diabetes related chronic conditions explains the scores in health related quality of life. Hospitals give an opportunity for medical intervention in case of physical and mental function through proper assessment of the threatening illness and providing care to promote acceptance of functional limitations.

Sharma, Gupta, and Bijlani (2008) in their investigation. They investigated the short-term effect of standard of living involvement based on yoga. Data were collected from ordinary and unhealthy individuals. Subjective well being levels were assessed in hypertensive patients with coronary artery disease and diabetic patients. Normal healthy individuals were incorporated in the study as control subjects. Subjective well being inventory was used to measure the inference of yoga. After 10 days of study the experimental subjects revealed good interpersonal relationship, enhanced mental health, improved well being, and better quality of life compared to control group.

Kosuri and Sridhar (2009) supported that the impact of a yoga on medical and mental outcomes in Type 2 diabetic patients. Thirty five subjects participated in a 40-day yoga camp. They studied medical, biochemical and psychological well-being. At the end of intervention, anxiety (P<0.05), body mass index P<0.001) and general well being (P<0.05) revealed a remarkable positive evidence of yoga intervention in improving mental health and clinical outcome in Type 2 diabetic patients.
Lakkireddy et al. (2013) also inspected the impact of yoga on atria fibrillation, depression, anxiety and quality of life scores of cardiac patients. Paroxysmal AF patients were recruited for study. After study period subjects had reduced symptoms, arrhythmia troubles, heart rate, blood pressure, anxiety and depression scores, and had a better quality of life in numerous domains of QOL.

Jyotsna et al. (2012) gave the result of a complete yogic breathing programme on glycemic control and quality of life (QOL) of diabetic patients. Those diabetic patients with HbA1c between 6% to 9% were made to undergo lifestyle change for three months along with antidiabetess medication after six months they were randomized into two groups. One group was given standard medication of diabetes while the second group was given standard medication and were told to practice comprehensive breathing techniques like sudarshan kriya yoga and pranayam. Observation of the changes in fasting and postprandial blood sugar, glycented hemoglobin and QOL as per World health Organization QOLBRIEF questionnaire, the group that practiced the comprehensive yoga breathing programme showed a trend towards better glycemic control in comparisons with the group that followed standard treatment alone. Although the improvement was not that great, the group practicing comprehensive yoga breathing techniques showed an improvement in the physical, psychological and social areas and total QOL.

Lin, Hu, Chang, Lin, and Tsauo (2011) reported how yoga affected the psychological health, physical health and quality of life of cancer patients. Through a systematic electronic databases studies were identified, selection was done of a randomized controlled trial in order to observe effects of yoga on cancer patients. The psychological health, which included lower levels of anxiety(p=0.09),
depression ($p=0.002$), distress ($p=0.003$), and stress ($p=0.006$); was better for cancer patients of the yoga groups.

Toobert et al. (2003) tested the effectiveness of the Mediterranean lifestyle Programme (MLP) in reducing cardiovascular risk factors in Type 2 diabetic menopausal women who were randomized to usual care (control) or treatment (MLP) conditions. The subjects went through an initial 3-day retreat which was then followed by weekly meetings to learn and practice the programme for a period of six months. Then changes in biological parameters like HBA1c, lipid profile, BMI, blood pressure, plasma fatty acids, and flexibility impact on quality of life were evaluated. MLP condition group was compared to usual care group on BMI, plasma fatty acids, and QOL at the six-month follow-up. Favouring intervention in lipids, blood pressure, and flexibility but these did not have statistical importance.

Cramer, Lauche, Langhorst, Dobos, and Paul (2013) studied the relation between yogic practices and QOL and mental health of chronically ill patients. A comparative study of chronically ill patients who practiced yoga regularly and those who did not practice regularly yoga and who were individually matched to each was done. The group which practiced yoga regularly had a better QOL as compared to the control subjects.

Myers et al. (2013) studied the effect of exercise and the improvement in QOL of Type 2 diabetics. The study compared the effect of aerobic training, resistance training or a combination of both with a group of non-exercise control of Type 2 diabetics patients. HbA1c in sedentary life. The short form-36 health survey questionnaire was used to assess changes in QOL after exercise training. All these exercise training conditions showed an improvement in the QOL physical component
subscales (PCS) and general health subscale (GHI) as compared to control group. The QOL of Type 2 diabetic patients improved with exercise. Much better benefits can be reaped in QOL areas with a combination of aerobic and resistance exercise.

Oken et al. (2006) examined how yoga affected cognitive function, extreme tiredness, mood and QOL in seniors. The study covered a group of 135 generally healthy men and women of 65 years of age who were made to attend health yoga for a period of six months. Results were based on performance on stop test, a qualitative electroencephalogram (EEG) measure of alertness, SF-36 health related QOL, profiles of mood states related to the intervention. Improvement in physical as well as QOL measures linked to sense of wellbeing, energy and fatigue as a result of yoga could be seen as compared to controls.

Koliopoulos et al. (2012) surveyed poor urban hospitalized diabetics with disease severity expected path of disease and self rated health linked QOL. Using the brief illness perception questionnaire, the SF-36, the comparative risk questionnaire and glycosylated hemoglobin date were collected. Intensity was defined by glycosylated haemoglobin level and current microvascular disorders from diabetes. Hospitalized adults with diabetes represent a suboptimal physical and mental functioning and Suboptimal quality of life. This could be due to intensity of diabetes and the awareness of being diabetic, a life threatening disease.

Chandwani et al. (2014) reported that yoga offered unique benefits for lighting extreme tiredness to women suffering from breast cancer and who were undergoing radiation therapy. Yoga exercises along with controlled breathing, medication and relaxation techniques into a single treatment plan helped the patients experience
improved ability to perform their daily activities better general wellbeing. simple stretching exercises counteracted fatigue, and maintenance of cortisol (stress hormone) not only that women who participated in the yoga programme were better equipped to overcome their illness experience which decreases overtime for women of control group.

2.2.6 YOGA AND SLEEP

Sleep is an important component in each individual’s life. Sleep disturbance may disturb the total functioning capacity of a person. Poor sleep and sleep quality determine the health status of an individual. All chronic disease conditions are always correlated with sleep disorders. Poor sleep quality, sleep latency, sleep disturbance are the main components of poor sleep. One need to have good sleep habits to lead a healthy life in today’s world. Types 2 diabetic often sleep disorders that include symptoms like poor sleep quality and daytime sleepiness. Poor sleep quality and daytime sleepiness were linked to various aspects such as low mood level, feeling of incompetence in management of own diabetic, increasing control problems, low level of confidence in self care efficacy, decreased support to self management behaviors. In the coming years diabetes educators will have to consider PSQI screening for poor sleep quality and Epworth Sleepiness Scale (ESS) for excessive daytime sleepiness as proven test for diabetics, especially those who find difficulty with self-management. A natural conclusion of this research is that it would be appropriate to make an active approach to evaluate and then to refer for treatment of possible sleep disorders in Type 2 diabetics. Also still more research is needed to find out if treatment of specific sleep disorders brings about an improvement in daytime functioning and the ability to integrate self management.
Vera (2009) reported that in yoga reveals an interesting and beautiful relationship between mind and body in incorporating physical movement in the body (positions), breathing exercise (pranayam) and meditation all rolled into a single programme. Many types of mental and physical benefits have been attributed to this ancient and comprehensive method. The effect of yoga over a long term on subjective sleep quality (SSQ) and on various hormonal parameters like, hypothalamus, pituitary, adrenal (HPA) axis were inspected the quantified values of adrenocorticotropichormone (ACTH), cortisol, dehydroepiandrosteronesulphate (DHEA-S) were recorded based on blood samples obtained from the participants. Similarly the PSQI was used to assess SSQ. The results indicated that the yoga group showed lower (PSQI) score though their blood cortisol levels were higher than control group participants. Greater psychological benefits like better sleep quality and morbidity action on the control level linked to yogic practices. These initial results suggest that this medical implication should be further researched.

Khalsa (2004) addressed the impact of yoga in reducing sleep problems and depression in chronic insomnia sample, yoga helped to enhance sleep, counting sleep effectiveness, total sleep time, sleep onset latency, number of awakenings and sleep quality measures based on sleep-wake diaries. Manjunath and Telles (2005) likewise highlight the key discoveries of effective yoga performance for six months among elderly subjects. Reduced sleep disorder was observed in elderly samples after yoga intervention.

Cohen, Warneke, Fouladi, Rodriguez and Reich (2004) assessment findings of psychosomatic modification and sleep quality of a Tibetan yoga (TY) involvement among lymphoma patients. TY practicing Patients took part in 7 weekly yoga classes.
At the end of intervention Tibetan yoga practicing subjects had a less sleep disorder compared to the counterpart of the group (P < 0.004). They had enhanced sleep quality (P < 0.02), quicker sleep latency (P < 0.01), longer sleep duration (P < 0.03), and less use of sleep tablets (P < 0.02). However, there was no difference between in aspects such as avoidance, state of anxiety, depression and extreme tiredness. The increasing number of participants in the TY group indicated that a TY programme was feasible for patients and that sleep linked results could be improved with such a programme.

Zhu, Li, & Yu (2014) investigated the sleep of Type 2 DM patients and its effects on glycaemic control. PSQI was employed to assess the quality of sleep and its threshold at PSQI. The glycosylated haemoglobin A1c (HbA1c) test was used to measure the glycaemic control with threshold at HbA1c < 7%. The PSQI score was 8.30 ± 4.12. The sleep disorder incidence rate was 47.1%. Patients with HbA1c 7% had significantly lower PSQI global and factor scores (p < 0.01) versus the control group. Sleep latency, sleep disturbance, and daytime dysfunction were the risk factors for poor glycaemic control. Patients with Type 2 Diabetics have high sleep disorder rate negatively impacting glycaemic control. Health care providers should pay close attention to the sleep quality of Type 2 Diabetic patients, and provide them with appropriate educational material.

Chasens, Korykowski, Sereika and Burke (2012) investigated the connection between defective sleep quality and day time sleepiness on self reported diabetes control and how social factors affect diabetes. The investigation covered 107 Type 2 Diabetic self managed participants with self reported daytime sleepiness. Their subjective sleepiness was rvalue using Epworth sleepiness scale, PSQI was employed to measure sleep quality, and its 3 factors of perceived sleep quality, sleep efficacy and sleep
disturbances, to measure difficulty in maintaining glycemic control, the Diabetes Care Profile Scale (DCP) was employed. Diabetic related factors like poor sleep quality was linked to poor scores on the DCP with lower diabetic control, negative attitude, decrease in positive attitude, lower self adherence and decreased adherence to dietary patterns. Lower diabetes self management is also linked to poor sleep quality and daytime sleepiness.

Galantino, Cannon, Hoelker, Iannaco and Quinn (2007) reported that yoga have declared that benefit of yoga to cancer patients has resulted in improvement in sleep quality, strength, flexibility and quality of life. Positions, pranayamas and meditation the three parts of yoga have been shown to reduce fatigue and improve notions of vitality. Exercise especially combination of walking and yoga have helped to reduce fatigue and improve QOL in breast cancer patients.

2.2.7 YOGA AND MENTAL HEALTH

Uebelacker et al. (2010) evaluated the ability of yoga to treat cases of depression and possible mechanisms. Only medical trials were included in the review and the number of participants varied between 28 and 89 of the file studies conducted to compare yoga to no minimal treatment. Four studies showed some proof that yoga was indeed superior to control groups. A formal assessment of 8 clinical trials proved that yoga could help treat depression.

Birdee et al. (2008) used nationwide Health Interview Survey for collecting information from 31,044 subjects with help of alternative Medicine Supplement. Yoga practitioners, about 58% feel that yoga was an important element in sustaining better physical condition and happiness. A greater part of these yoga practitioners disclosed that 83% had good mental health and 76% had better orthopedic wellness.
Chen et al. (2009) reported the effect of six months yoga practice in promoting mental health, sleep quality and self perception of older adults. Yoga training was implemented for six months. Yoga practiced three times in a week each session consisting of seventy minutes. Mental health assessment was done along with Pittsburgh Sleep Quality Index. After six months of yoga practice the experimental group showed extensively improved mental health, sleep quality, daytime dysfunction, physical health perception, mental health perception and depression in comparison to the counterpart subjects. This improvement was observed around six months.

Woolery, Myers, Sternlieb and Zeltzer (2004) reported how yoga had an effect on the mood of mildly depressed young adults over a short term time. For this 28 mildly depressed adults between the ages of 18 and 29 were assigned to an yoga intervention group. The participants were put through a five week Iyengar yoga programme which consisted of 2 one hour class per week. Employing the Beck Depression Inventory (BDI), State Trait Anxiety Inventory (STAI), Profile Of Mood State (POMS) before classes, midway through the programme and at the end of the programme, to depression and anxiety levels were measured as well as morning cortisol levels were recorded at the said time points. The results indicated that there was a great reduction in depression level, trait anxiety and total mood disturbances among participants of the yoga group in contrast to the control group. Not only that participants of yoga group showed higher morning cortisol levels.

A study by Gupta, Khera, Vempati, Sharma and Bijiani (2006) reported the impact of yoga on state and trait anxiety. The yoga course consisted of an eight day course with a 3 to 4 hours/day or a period of 10 days and it involved performing asanas, pranayamas, relaxation techniques, group support, individual support, lecture, films.
The study covered persons who had hypertension, coronary artery diseases, diabetes, obesity, psychiatric illness and thyroid disorders. Anxiety scores which were recorded on the first and last day of the course showed a marked improvement for diseased people. To make it widely acceptable to participants and medical profession, sudarsahan Kriya Yoga a modified version which did not contain components like briefing about positive attitude to life, living in the present etc and meditative aspects and the physiological aspects of specified breathing rhythms. The yoga class consisted of sequential component in between normal breathing while sitting with eyes closed which ended with a 10-15 minutes of Yoga Nidra (tranquil state) in supine position.

Janakiramaiah et al. (2000) examined the antidepressant capability of sudarsahan Kriya Yoga (SKY). The study divided the participants into 3 groups. The first group received electroconvulsive therapy 3 times per week 1 or 4 weeks, the second group administered a standard dose of imipramine antidepressant medication while the third group was asked to practice SKY daily. The outcome found SKY equally effective as medication and nearly as effective as electroconvulsive therapy in the reduction of depression in patients.

Similar findings was reported by Vedamurthachar et al.(2006) for alcohol dependent individuals. Effects were measured with the use of beck depression Inventory and plasma cortisol levels. Both group showed a decrease in self reported depression symptoms according to BDI. In addition to that a relation between depression symptoms and lower levels of morning plasma cortisol among the intervention group participants. The measures of cortisol level indicate a biological pathway for the programme participants. The small size of the group may lead to a confusion on these results. Those conducting the study also found that over the same period depression symptoms
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reduced in all patients. However, in participants who practiced yoga there seem to be a biological pathway between the level of decrease and its impact on cortisol and deduced depression. Among a randomized control trials group of consenting participants in an alcohol detoxification programme yoga practices proved to have defect of antidepressants. A probable biological mechanism for yoga’s impact could be shown with the help of cortisol measures and prolactin. A great improvement in the subjective wellbeing of the participants could be attributed to changes in life style and stress management educational programme. This in turn leads to a remarkable contribution to primary prevention and management of lifestyle diseases.

Sharma et al. (2008) explored the short term impact of yogic practices on the personal wellbeing of normal healthy individuals and persons who had illnesses like hypertension, coronary artery diseases and diabetes. The subjective wellbeing inventory showed a great improvement in the subjective scores of 77 patients within a period of 10 days in contrast control.

Lee, Mancuso and Charlson (2004) measured how changes affected health related quality of life in mind body training in community based settings. The participants attended a 1 hour class 2 or 3 times in a week. They were asked to questionnaire before the class began and another questionnaire at the end of 3 months which contain questions on mental and physical health from proven survey instruments. The participants showed a lower score in the SF 36 general health questionnaire before the class began. But there was a marked improvement in all areas of the questionnaire after the 3 months period. The changes in the score included an increase of 15.5 in the mental domain proving that even a 3 month yoga programme improved measures like mental health and other quality of life scores.
Ross and Thomas (2010) reported the effect of yoga and exercise on a variety of health outcomes and health conditions in a formal assessment of studies, we could thus see the way yoga intervention was almost equal and in some cases even superior to exercise in all almost all outcomes measured except those involving physical fitness.

2.2.8 COMPLICATIONS

As per the World Health Organization’s Diabetes Fact Sheet (No.312, Aug 2011), cardiovascular disease, blindness, limb amputation and foot ulcers were the major causes for death in 50 percentage of diabetic persons. Main diseases that affect people who are diabetic for more than 15 years, are blindness (2%), development of acute visual impairment (10%) and kidney failure (10-20%). Major symptoms of diabetic neuropathy are pain, tingling, numbness or weakness in the feet and hands. The death rate in diabetic persons is double higher than persons without diabetics. The World Health Organisations has estimated that about 558 billion Us dollars of the national income of China will be lost during the period 2006 – 2015 as a result of diabetics, stroke and heart diseases alone.

In the USA, non traumatic lower limb amputation, kidney failure and newly reported cases of blindness among adults were caused mainly due to diabetics. In 2011, National Diabetes Fact Sheet, Centre for Disease Control and Prevention (CDC) reported the above said findings. In the USA, diabetics stands at $7^{th}$ position among the major causes of death and it is a main reason for stroke and heart disease. Wild, et al. (2011) found that diabetes was at $4^{th}$ or $5^{th}$ position among diseases which caused death in developing countries. He also found that Type 2 diabetics reduced the lifespan of affected person to 5 – 10 years.
Hanser and Longo (2008) found that the high prevalence of Type 2 diabetics and complications of diabetics caused a great burden to India’s health care sector. There are mainly two types of long term complications of diabetics; namely, Macro Vascular Complications and Micro Vascular Complications. Macro Vascular complications include Hyper tension, Myocardial infarction, dyslipidemia and Stroke. Micro Vascular Complications include Nephropathy, Retinopathy, Diabetic neuropathy, Neurogenic bladder, Diarrhea, Impaired Cardio vascular reflexes, Diabetic foot disorders and Sexual dysfunction.

Sosale et al. (2014) confirmed that newly diagnosed Type 2 diabetic persons in India were having chronic complications. The number of patients newly diagnosed with T2D was 4600; out of which 67% were males and 33% were females. And 40% of them belonged to the age group of 41 – 50 years. The following were the complications found in the patients: Neuropathy (13.15%), Retinopathy (6.1%), Nephropathy (1.06%), Hypertension (23%), Obesity (26%) and Dyslipidemia (27%). The last three are the risk factors of Macro Vascular Complications. Mohan et al. (2007) stated that the prevalence of pre mature coronary artery disease is found at a higher rate in Indians when compared to other ethnic communities. But Nephropathy and Retinopathy, the Micro Vascular Complications of diabetes, prevailed at a lower rate among Indians.

Kutty and Raju (2010) stated the growth of gestational diabetes in India were very alarming, because 60% of the gestational diabetics were known to develop diabetics at later stage in life. The statistics showed that diabetes was a matter of great concern for public health. The diabetic persons are more likely to develop or undergo the following conditions than non diabetic persons; Blindness (25 times more), Kidney
disease (17 times more), Undergo amputation (30 – 40 times more), Myocardial infarction (2-4 times more) and Stroke (2 times more).

Newton, Gapstur, Campell and Jacobs (2013) studied about the relation between bladder cancer and Type 2 diabetes. They got to know about the insulin use and diabetes from the survey conducted in 1992, 1993, and 1997. And they updated the data every two years. In 2007, 172,791 persons participated in the survey, and 1,852 of them were identified with incidence of bladder cancer. Among the participants who had T2DM for more than 15 years and who were using insulin, bladder cancer was found at a higher rate.

2.2.9 MORTALITY & MORBIDITY

According to WHO-Diabetes Fact sheet No 312 August 2011, 346 million are diabetic in this world. In 2004 an estimated 3.4 million deaths were due to a result of high levels of blood sugar. The low and middle income countries showed nearly 80% diabetes deaths and projections of WHO reveal that between 2005 and 2030 deaths due to diabetes will be twice as much. 90% of diabetics are Type 2 diabetics around the world and it is because of their excess body weight and physical inactivity when earlier this type of diabetics was seen occurring in children as well. There are four million death occurs in worldwide due to diabetes in 2010: they belong to the age group of 20-79 years. There were 109 thousand deaths in India due to Diabetes and 2.263 million disability adjusted life years in 2004 (International Diabetes Federation (IDF) Report 2009).

Pan, et al. (2013) evaluated the link between red meat consumption between a 4 year period and a subsequent 4 year risk of Type 2 Diabetes in American adults. Three group studies were conducted which consisted of 26357 men from health professional
(1986-2006) and 24677 women in the nurses’ health study (1991-2007). By employing food frequency questionnaires, which were updated every 4 years, diet was evaluated. An increase in risk for Type 2 Diabetes was directly linked to increasing red meat consumption which was observed over a 4 year interval. A 14% reduction in risk was attributed to a reduction in red meat intake by more than 0.50 serving per day from the start to the first 4 year follow up. An increasing subsequent risk of Type 2 Diabetes was thus linked to increased intake of red meat.

Cavanaghl et al. (2012) estimated the treatment expenses and cost to patients of 5 different countries of Chile, India, Tanzania and US. A treating physician who was also a co-author of the said country was asked to make a choice of treatment plans that represented a standard application of local recourses to the diabetic funding unit (DFU). The results were defined in advance as complete healing in 1st case and trans-tibial amputation and 2nd case through the course of treatment was decided by each investigation in such a manner that would be standard for their clinic. Local hospital administrators helped in arriving at the cost of each course of treatment in the local currencies. The cost burden to the patient was calculated based on the standard Reimbursement scenarios in each country were then expressed as a percentage of the annual percapita purchasing power equivalent to gross domestic product. Based on the availability of resources and realities of local conditions, there were great differences in the treatment plans among different countries. The medical care cost in first case was between102 and 3959 in Tanzania and the United states. The QOL, micro vascular and macro vascular complications of diabetes has considered as a burden for India’s healthcare expenses. 379billion dollars are the estimated expense globally for the
healthcare in 2010. This would increase up to 490 billion dollars by 2030. IDF Diabetes Atlas (2011).

Basu et al. (2014) said that taxing sugar sweetand beverages (SSBs) has an indirect effect on reducing the obesity in high income countries. In India the consumption of SSBs causes vast diseases. Acceleration of tax has caused a reduction in the consumption of SSBs. This would lead a marked reduction in BMI, overweight, and obesity.

2.2.10 PREVENTION

Hu (2011) reported that the evolution in the standard of living and food pattern of developing countries speed up the diabetic spread in the nation. Research findings highlight the importance of life style change and food pattern modification for the control of Type2 diabetes. To bring out this change, essential changes should be introduced to the health care system and public policies. Prevention of diabetes could be possible only through food and lifestyle modification. This is possible only through prioritization of global public policy.

The diabetes prevention program (DPP) confirmed that intensive changes in lifestyle (diet and exercise for 30 min/day five times/week) in individuals with IGT prevented or delayed the development of Type 2 Diabetes by 58% compared to placebo. All participants had similar effect irrespective of gender, region, and age. Individuals with a strong hereditary of Type2 Diabetes and individuals with IFG or IGTT should maintain a normal BMI and engage in regular physical activity. Pharmacological therapy for individuals with prediabetes is currently controversial because its cost-effectiveness and safety profile are not known. Fauci et al. (2008).