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**Dr. Nutan**

Assistant Professor, Department of Food and Nutrition (Home Science), BPSIHL Bhagat Phool Singh Mahila Vishwavidyalaya Khanpur Kalan, Haryana, India

### Naturopathic lifestyle: A strategy to manage non-insulin dependent diabetes mellitus (NIDDM)

**Dr. Nutan**

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#### Abstract

NIDDM is a frequently encountered disease highly prevalent in the world and creeping up speedily to cover all age groups.

The diabetes has been analysed from its grass root level starting from the understanding of etiology meaning of diabetes along with its understanding in ancient and modern literature as well as the Diagnostic and screening criteria of diabetes mellitus, relationship of diabetes with obesity and last but not least role of naturopathy in management of NIDDM.

As we all know naturopathy covers all aspects of our life style modification it includes various kinds of modern exercise as well as yogasanas and stress relieving techniques. Hence, this review covers all the aspects of lifestyle modification in detail to manage diabetes like Exercise, yogasanas and alternative medical practices to manage diabetes. Moreover, naturopathy believes that our body is made up of five basic elements and all the ailments can be treated with various kinds of therapies related to these basic elements of human body. These therapies include hydrotherapy, mud therapy and colour therapy etc. Along with these therapies various kinds of alternative practices

Are also discussed that are utilised at Naturopathy centres to manage diabetes like acu pressure, foodtherapy and massage etc. However, being the most important Lifestyle management therapy - food therapy has been dealt in detail.

**Keywords:** BMI (Body Mass Index), LDL, VLDL, RDA, naturopathy etc.

#### Introduction

NIDDM (Non-Insulin Dependent Diabetes Mellitus) is a syndrome which is characterized by a raised glucose level of the blood due to diminished effectiveness of insulin. Additionally, the metabolic derangement in long standing poorly controlled diabetic cases leads to one or more chronic complications such as neuropathy, retinopathy and complications related to the cardiovascular system. Both aging and diabetes are associated with hyperglycemia, hyperinsulinemia, insulin resistance and hypertension (Stout, 1990) [22]. Patients with diabetes alone have twice the risk of myocardial infarction, but those with hyperlipidemia have a far higher risk. (Assman and Schulte, 1989) [39]. Diabetes, like obesity and atherosclerosis, is likely to arise in predisposed who eat too much and exercise too little. Treated diabetic patients still have an overall mortality of two and a half time that of non-diabetic population. Largely due to an increased death from coronary heart disease (Pell and Alongo, 1970) [40]. Keeping in mind the fatality of this lifestyle disorder this review paper has been designed to make all aware about the multifarious scientific approach of Naturopathy in management of this Lifestyle disorder.

#### Prevalence of diabetes

Diabetes is an “iceberg disease”. According to WHO, the global prevalence of type 2 diabetes will be more than double from 135 million by 2025. More than 15 per cent of Americans over age 65 has diabetes, 2.4 million more seniors have undetected Diabetes. In developing countries global burden of this disease is proposed to be 77 per cent (Park, 2000) [23]. World Health Organization (WHO) has declared India as the “diabetic capital of the world” (Gupta, 2000) [24].

**Corresponding Author:**

**Dr. Nutan**

Assistant Professor, Department of Food and Nutrition (Home Science), BPSIHL Bhagat Phool Singh Mahila Vishwavidyalaya Khanpur Kalan, Haryana, India

He stresses that India will have the greatest magnitude of increase, approximately 170 percent by the year 2025 AD. The recent projections from WHO (Radha *et al.*, 2003) [25] suggest that India has 15 per cent of the total diabetics in the world-wide.

### Etymological meaning of diabetes

The word diabetes is derived from the Greek word meaning to siphon; to pass through and mellitus came from the Latin word honey.

### Ancient definition of diabetes mellitus

Panda (2005) [16] summed up the definitions of diabetes given by well-known ancient medical practitioners as follows:

*Charka* has defined *madhumeha* as a disease in which one passes urine, which is astringent, sweet and rough.

*Sushruta* has denoted the term *madhumeha* as *Kshudrameha* and said that the urine in this condition resembles honey and has a sweet taste.

*Vagbhata* has described *madhumeha* in the same manner like *Charaka* but he also added that not only the urine is sweet but also sweetness appears in the whole body.

### Modern definition of diabetes

According to WHO, (1999) [19] diabetes is a disease in which the body does not produce or properly use insulin. Insulin is a hormone that is needed to convert sugar from starches and other food. It is characterized by chronic hyperglycemia with disturbance of carbohydrates, fat and protein metabolism resulting from defects either in insulin secretion or in insulin action or birth.

Srilakshmi (2002) [26] identified diabetes mellitus, a chronic

metabolic disorder that prevents the body to utilize glucose completely or partially. It is characterized by raised glucose concentration in the blood and alterations in carbohydrate, protein and fat metabolism. This can be due to failure in formation of insulin or liberation or its action in to energy needed for daily life. The cause of diabetes is a mystery, although both genetics and environmental factors such as obesity and lack of exercise appeared to play roles ([www.regrane.com/living/index.htm](http://www.regrane.com/living/index.htm), copyright 2003, ethicon inc).

Katitar (2003) [11] further reported that Diabetes mellitus results from the failure of the endocrine system to control the blood glucose levels within the normal limits. It can be understood as a disorder of carbohydrate metabolism and characterized primarily by hyperglycemia and glycosuria with secondary anomalies of the metabolism of protein and fat. It is not only the leading cause of blindness and renal failure and non- traumatic amputations in adults, but also a major cardiovascular risk factor in developing countries.

Thus two characteristic symptom namely Cupious urination and glucose in the urine give the name to the disease. The normal volume of urine passed daily is about one and a half liter, but in the diabetic condition it may vary from four to twenty litres. The urine is of pale colour, has an acidic reaction and sweetish odour. The quantity of sugar present in it varies from one and a quarter decigram to two and a half grams the total sugar per day in many cases reaching as much as one kg in 15 litres of urine. (Bakhr, 2006) [2].

### Diagnostic and screening criteria for diabetes mellitus

The diagnostic criteria for diabetes mellitus is depicted in the Table 1.

**Table 1:** Normal, impaired and diabetic plasma glucose levels

	Fasting plasma glucose (mg/dl)	Casual plasma glucose (mg/dl)	Oral Glucose tolerance test (2hr.after 75g glucose in water) (mg/dl)
Normal	<110		<140
Impaired or prediabetes	≥ 110 to <126 (IFG)		140 to 200 (IGT)
diabetes	≥ 126	≥ 200	≥ 200

**Source:** Expert committee on the diagnosis and classification of diabetes mellitus, Report of the expert committee on the diagnosis and classification of diabetes mellitus. Diabetes care, 20: 1183 (1997).

### Types of diabetes

There are a numerous types of diabetes however this review paper. Deals only with NIDDM as this is the most frequently encountered disorder as an outcome of faulty lifestyle so can be managed effectively by a whole sole natural shift in all aspects of life.

### Diabetes and obesity relation ship

A strong predisposing factor in middle age diabetes is obesity. Obese people on glucose load secrete more than the normal amount of insulin. Those with upper body obesity have glucose tolerance that improves with weight reduction while those with lower body weight do not have a tendency to diabetes (Kissebah *et al.*, 1982) [13]. According to Khan *et al.* (1999) [27] individuals who consume too much sugar, fat and those who are obese are more prone to the disorder. However Horwitz (1982) [28] reported a decrease of 50% risk of diabetes with decrease in the body weight.

According to Bjortrop (1990) [3], abdominal fatness is associated with an increase in incidence of NIDDM during an eight year follow up of 113861 women aged 30 to 55 years in the USA, the risk of developing NIDDM increased with increasing BMI (Colditz *et al.*, 1995) [4].

In oral glucose tolerance test performed by Chang *et al.* (1992), on thousand subjects out of which 64 men with BMI>27.6 and 936 were women with BMI>28.3 Kg/m<sup>2</sup>. The results showed the incidence of impaired glucose tolerance in diabetics to be higher in obese individuals and the prevalence increases with abdominal obesity which is more hazardous for diabetics.

Xavier (1996) [20], reviewed the effect of weight on the prevalence of NIDDM and its associated conditions. Weight loss decrease the morbidity in diabetic patients. The recommendation was made that person with NIDDM who has BMI>25 should try to lose weight. The reason for the increased incidence of diabetes with obesity is partly related to the insulin resistance created by the obese state (Abu and Pi-snyer, 1997) [41].

### Naturopathy and its role in treatment of NIDDM

Natural approach has first to think of the removal of the causes which bring diabetes. Pancreas have to be activated. This objective could be achieved in various ways like by providing proper nutrition, helio therapy, hydrotherapeutic techniques, proper exercises and acupressure which sends more life force to that organ. Yoga asanas could effectively

massage and lubricate pancreas in to meaning ful action. Assistance could be available from the practice of pranayam also. Natural ways can succeed where drugs have failed to control diabetes. The diabetic must get rid of the excess fat. Sedentary life must give place to action and exercise which is the scenario of naturopathy.

Diet and Exercise have to be geared in such a manner that their efficacy is neither lost nor reduced (Rao, 2000) [29].

Nutan and Kochar (2008) [42] Anthropometric, biochemical and dietary assessment was carried out before and after one month of naturopathy treatment for 60 patients in the age of 40-60 years. Post treatment weight reduction in male and female subjects were 6.20 and 9.78 percent. BMI reduced from 24.31 to 23.55 for male and for female from 25.96 to 23.51. Percentage reduction as compared to RDA of carbohydrate, energy and fat intake in male subjects was 10.66, 38.86 and 102.35 percent. Corresponding values for female were 18.62, 31.08 and 77 percent. Contrary to the intake of carbohydrate, energy and fat, Vitamin C intake increased by two folds, Vitamin A too raised by five folds because of this hemoglobin moved up significantly at both levels and cholesterol, LDL, VLDL, Triglyceride and blood Glucose level decreased by 29.72, 29.91, 16.74 and 46.66 percent. Corresponding reduction in female was 32.96, 39.40, 17.65, 20.24 and 49.91 percent.

### Strategies adopted at naturopathy centers to manage diabetes

Strategies adopted at Naturopathy centers to combat Diabetes are explained below:

**1. Exercise:** Dewan (2007) [5] has stated that regular moderate activity is better than occasional vigorous bursts. The potential health benefits of regular exercise for diabetics are as follows:

- Glycemic control can be maintained (Bamji *et al.*, 2003) [10] through regular exercise for 5 years at least (Bamji *et al.*, 2003; Dewan, 2007) [10, 5].
- Prevention of cardiovascular disease through improvement in insulin sensitivity through exercise (Bamji *et al.*, 2003; Dewan, 2007) [10, 5].
- Reduction in body weight (Dewan, 2007) [5]. Bamji *et al.* (2003) [10] has also stated that reduction of weight help in controlling diabetes in much effective way
- Regular physical activity has been found to be effective in reducing levels of triglyceride rich, very low density lipoprotein (Bamji *et al.*, 2003; Dewan, 2007) [10, 5]
- Reduction in blood pressure of hyperinsulinemic patients has been observed (Dewan, 2007) [5].

Dewan (2007) [5] has reported that one of the major risk factor of diabetes in elderly is lack of physical activity which leads to reduced insulin sensitivity so by regular physical activity it could be reduced to a significant extent. In order to achieve aforementioned benefits naturopathy centers used to introduce significant change in activity pattern of patients which include regular exercise, walking and yogasanas etc.

**2. Yogasanas:** Asanas should be practiced only after one hour of refreshment or after three hours of a major meal. A diabetic should eat something immediately after asanas. Yogasanas do not cure diabetes but some of the poses activate thyroid gland, by flexing the spine, stimulate nerve impulses to pancreas, some massage the pancreas and others effect the whole metabolism in such a way that they see the healing energies of

the fresh circulation going to the pancreas (Thakur, 1996) [31]. According to Thakur (1996) [31] and Mishra (2007) [15], asanas which help control diabetes are *Svangasan, Vajarasana, Halasana, Bhujangasan, Dhanurasan, Ardh Matsyendra, Paschimottasana and Savasana*.

Practice of yoga regularly not only enhances physical activity but also improves mental activity and flexibility of the body. Many diabetics in India prefer yoga as a means of exercise (Raghuram, 1999) [33].

**3. Stress relieving techniques:** Stress brings about physical changes in the body. Certain stress hormones e.g. adrenaline are secreted. These hormones have anti-insulin action as sugar is released from the liver. Repeated conditions of stress result in deficiency of insulin in the body. Meditation, yogic nidra (Mishra, 2007) [15] and other relaxation techniques are used for controlling diabetes.

**4. Pranayam:** Breathing exercise are pranayams. Recommended pranayam for diabetic patient according to Thakur (2000) [32] and Mishra (2007) [15] are; *Nadi Shodhak Pranayam, Ujjayi pranayam, Bhastrica pranayam, Kapalbhathi kriya etc.*

**5. Hydro therapy:** Hydrotherapy affords a thoroughly rational method of treating Diabetes by increasing the effectiveness of pancreas and increases circulation to the relevant parts of the body (Hiralal, 2000) [9]. According to him some hydrotherapy actions taken for the diabetics are warm shower on abdomen, hot baths, cereal bath, heat producing stomach bandage, cold friction sitz bath, wet sheet pack, cold friction bath and hot and cold compress.

**6. Mud therapy:** In diabetes there is disturbance of the metabolic processes of the entire body, the digestive system and the endocrine glands do not work fully, the result is accumulation of impurities and toxemia in the body. Improving elimination and removal of the toxins become important. Mud is applied on abdomen in case of diabetics (Seth, 2000) [34].

**6. Colour therapy:** Diabetes is generally caused by deficiency of orange and yellow colours in the body. Take fruits and vegetables which have these two colours in the body. Take fruits and vegetables which have these two colours in abundance (Bakhr, 2000) [35].

Lemon yellow is the colour of the pancreas. It is associated with buoyancy and it is used to control diabetes. But mainly green and orange colours are helpful in controlling diabetes. Leaves of jamun tree may be dried in shade and powdered. Two bottles, one orange and one green may be taken and filled half with that powder. These may be corked and placed on an unpolished wooden piece in an open place exposed to the rays of the sun. It will stand charged after 30 days. A tea spoon from each of these bottles may be taken with half a cup of orange charged water in the morning by diabetics (Aneja, 2000) [36].

**7. Acupressure:** Certain points in our body which help in reduction of blood sugar are Pressure points in the center of the palms in alignment with the bottom of the ring finger and on the soles of the feet (Shah, 2000; Bakhr, 2000) [17, 35].

### Life pattern and naturopathy

**1. Unwise Indulgence:** Eating too often and eating larger

quantities of food than the body requires and feasting and taking meals when there is no hunger, individual fads and notions, overeating due to various social and cultural influences (Dewan, 2000)<sup>[6]</sup>.

**2. Unwise dietetics:** Over consumption of highly refined foods, soft drinks, adulterated foods and foods with additives; living on artificial commercialized, denatured and devitalized foods; excessive consumption of fats, proteins and carbohydrates which disturb the mineral and vitamin balance and lead to obesity.

Naturopathy further stress that civilized people lead unnatural lives dietetically. They do not eat in accordance with body requirements. Reasoning has not been used in the evolution of diet.

The patient should avoid tea, coffee and cocoa because of their adverse influence on the digestive tract. Other foods which should be avoided are white bread, white flour products, sugar, and tinned fruits, sweets, chocolates, pasteries, pies, puddings, refined cereals and alcoholic drinks (Dewan, 2000)<sup>[6]</sup>.

### Food therapy for NIDDM

Sasikala and Subapriya (2006)<sup>[43]</sup> remarked diabetes as the major cause of morbidity and mortality in spite of rapid developments in medicine. They declared dietary modification, weight control and regular exercise as the main approaches in the management of diabetes, diet being the sheet anchor.

Certain food habits must also be followed. As stated by Mohan *et al.* (2003)<sup>[37]</sup> from Madras Diabetes Research Foundation, Chennai on the basis of the study of diabetes mellitus in south Indians that the increased intake of whole grains and legumes and reduced intake of fat specially saturated fat also improve insulin sensitivity and reduce the risk of diabetes independent of weight loss.

These recommendations are synchronized with the common dietary recommendations of naturopathy centers. But if because of heredity, environment or taste you are in danger of diabetes, then certain special foods must also be taken or given up for preventing that condition and for overcoming the problem. All these aspects are dealt below:

Any successful method at diabetes treatment should aim at removal of the actual cause of the disease and building up of the whole health level of the patient. Diet plays a vital role in such a treatment (Bakhru, 2000)<sup>[35]</sup>.

### The primary dietary consideration for a diabetic patient

The primary dietary consideration for a diabetic patient is that he should be a strict lacto vegetarian and take a low calorie, low fat, alkaline diet of high quality natural foods. Fruits, nuts, vegetables and whole meal bread and dairy products form a good diet for the diabetic (Bakhru, 2000)<sup>[35]</sup>.

All fruit and vegetables are extremely good for diabetics. They are high in fibre, low in fat and packed with vitamins and minerals. Fruits can also be consumed as perfect snacks (Diabetovalens.com, 2007)<sup>[21]</sup>.

These foods are best eaten in as dry condition as possible to ensure thorough salivation during the first part of the process of digestion (Bakhru, 2000)<sup>[35]</sup>.

Cooked starchy foods should be avoided. As Abeywardena (2003)<sup>[1]</sup> on the basis of her Asian research studies reported that- Many Asian diets are high in carbohydrate and low in fat. The popular carbohydrates consumed now a days by Asians tend to have high glycemic indices and result in rapid

delivery of glucose to the blood stream. The high carbohydrate diets also modify lipogenesis and lead to abdominal obesity (without necessarily being over weight), with unfavorable metabolic effects. In addition such compromised diets can result in adverse matrix interactions with increased intakes of saturated fat. Accordingly CVD among Asians is frequently associated with insulin resistance, diabetes and abdominal obesity.

Bakhru suggested that fresh foods can be taken without fear as they contain fructose sugar which does not need insulin for its metabolism and is well tolerated by diabetics. Emphasis should be on raw foods as they stimulate and increase insulin production. The patient should avoid over eating and take four to five small meals a day rather than three large ones.

According to Bakhru (2000)<sup>[35]</sup> following sample diet should serve as a guideline for a NIDDM subjects:

**Upon Rising:** A glass of luke warm water with freshly squeezed lemon juice.

**Break fast:** Any fresh fruit with the exception of bananas, soaked prunes, a small quantity of whole meal bread with butter and fresh milk.

**Lunch:** Steamed or lightly cooked green vegetables such as cauliflower, cabbage, tomatoes, spinach, turnip, asparagus and mushrooms, two or three whole wheat chapattis according to appetite and a glass of butter milk or curd.

**Mid afternoon:** A glass of fresh fruit or vegetable juice.

**Dinner:** A large bowl of salad made up of all the raw vegetables in season, after it fresh homemade cottage cheese.

**Bed time snack:** A glass of fresh milk.

Flesh foods increase toxemic condition underlying the diabetic state where as non-stimulating vegetarian diet made up of raw foods promotes and increases glucose tolerance. The most important nutrient in the treatment of diabetes is manganese which is vital in the production of natural insulin. It is found in the citrus fruits, outer covering of nuts, grains and in the green leaves of edible plants. Other nutrients of special value are zinc, B complex vitamins and poly unsaturated fatty acids.

### Medicinal Therapy

Kiruthika *et al.* (2003)<sup>[12]</sup> during the research study of exploring the role of phytochemicals in the treatment of diabetes mellitus strongly supported the supremacy of ancient food and medicinal connection on the basis of research findings of the presence of many medicinal properties in many commonly used remedies and stated that "Ancient Indian systems of medicine namely Siddha and Ayurveda which were neglected for so long by the western medical system are now relied upon for the treatment of diabetes mellitus (DM). Our traditional system of medicine are based on the application of 'phytochemicals' which are derived from herbs, fruits, vegetables, spices and other plant sources in treating DM. Studies by many scientists revealed the role of phytochemicals which are derived from herbs, fruits, vegetables, spices and other plant sources in treating DM. Studies by many scientists revealed the role of phytochemicals such as nimbin, glucoside alkaloid, jamboline, momordicine, trigonellin and allyl propyl sulphide which are derived from neem (*Azadirachta indica*), koi (Coccinia indica), jambu (*Eugenia jambolana*), bitter guard



(*Momordica charantia*), fenugreek (*Trigonella foenum graecum*), and onion (*Allium sepa*) respectively in lowering blood glucose levels. Many more commonly used phyto sources like goose berry (*Emblica officinalis*), tomato (*Lycopersicon esculantum*), fig (*Ficus bengalensis*), guava (*Psidium guajava*) and papaya (*Carica papaya*) are also claimed to possess hypoglycemic principles by many scientists.”

A short description of the role of various kinds of fruits and vegetables useful for iabetes and are used in plenty in naturopathic approach to manage diabetes by controlling blood sugar levels:

**1. String bean pod:** String bean pod tea is an excellent natural substitute for insulin and highly beneficial in diabetes. The skin of the pods of green beans are extremely rich in silica and certain hormone substances which are closely related to insulin. One cup of string bean tea is equal to one unit of insulin (Bakhr, 2000) [35].

**2. Cucumber:** Cucumber contain a hormone needed by the cells of the pancreas for producing insulin (Bakhr, 2000) [35].

**3. Onion:** According to Prabhakar Rao (2005) [30] onion has wonderful anti diabetic activities as per the modern studies. He quoted in ayurvedic scientific seminar on diabetes mellitus (28-29 march, 2005) that Indian researchers fed onion juice and whole onions in the dose of 25 to 200 gm per day to the subjects and found that the greater the dose, more the sugar was reduced. The active hypoglycemic agents are allyl propyl disulphide, allicin and similar to tolbutamide like compounds. In rabbit the extract of onion was 77 per cent as effective as standard dose of tolbutamide. Onion affect the metabolism of glucose in the liver, release of insulin and prevent the insulin destruction.

**4. Garlic:** Onion and Garlic have proven beneficial in reducing blood sugar in diabetes. Garlic contains zinc and sulphur which are the component of insulin. It has potassium and manganese. Some consider that low level of zinc or manganese may cause diabetes (Dewan, 2000) [6].

**5. Bitter gourd:** According to (Dewan, 2000) [6] bitter gourd is one of the best missiles in food therapy for diabetics. It contains plant insulin, which lowers blood and urine sugar levels. For better results, the diabetic should take the juice of four to five fruits every morning on an empty stomach. Powdered seeds of bitter gourd can be added to the food of a diabetic. Decoction of it, by boiling the pieces in water can be used by diabetics.

**6. Jamun:** Jamun is regarded as a traditional medicine for diabetes. The fruits, seeds and fruit juice all are useful in the treatment of this disease. The seeds contain a glucoside ‘jamboline’ which is believed to have a glucoside to check the conversion of starch into sugar in cases of increased production of glucose. They should be dried and powdered. This powder should be taken mixed in milk, curd or water (Bakhr, 2000) [35]. Off season, the stone of this fruit is powdered and can be taken 2 to 3 gms a day. Dried powdered leaves of jamun may be sun charged and used for controlling diabetes (Dewan, 2000) [6].

Lavekar and Aggarwal (Ayurvedic Scientific Seminar on diabetes mellitus, 28-29 march, 2005) [14] has reported a research contribution by Central Council of research in

ayurveda and Sidhha. In it the jumbo fruit pulp in the dose of 150 gm were given and blood samples were estimated for sugar levels at 1, 2 and 3 hours. Significant blood glucose lowering effect ( $P < 0.05$ ) was found in healthy volunteers.

**7. Fenugreek:** These are very commonly used in India for controlling diabetes. Effectiveness of these seeds is mentioned in Greek and Latin Pharmacopoea and also in Ayurvedic literature. These seeds can be used in chutney, leaves can be used as a vegetable. Methi seeds after a wash can be soaked in water and that water can be taken as first thing in the morning. Soaked seeds are dried and crushed in to a powdered form. One tea spoon twice daily with milk could help greatly (Dewan, 2000) [6].

The director National Institute of Nutrition Hydrabaad, India recommends inclusion in daily diet of fenugreek in amount of 50 to 100 gms as an effective supportive therapy in diabetes management.

Kochhar and Nagi (2003) [38] dried, powdered and mixed equal proportion of Fenugreek seeds, jambu seeds and fresh bitter guard and packed it in 500mg capsules. Salty biscuits were also prepared using the same amount of mixture. All subjects (N=60) were followed for one month as control group then divided in to two groups. Group I (n=30) were supplied 2 capsules (1gm mixture)/day and Group II (n=30) were given 2 biscuits (1gm mixture)/day for 45 days then the supplementation was doubled for next 45 days. Serum lipid level was tested in the beginning, after one month, after 45 days, after 3 months of feeding period. Supplementation of medicinal mixture showed for a period of three months showed a significant improvement in lipid profile by lowering serum triglycerides from 180.7 to 148.7 mg/dl in group I and 179.3 to 161.6 mg/dl in group II. The reduction in total cholesterol 211.8 to 179.6 mg/dl, LDL-C 138.0 to 91.3 mg/dl and VLDL-C 35.9 to 29.9 mg/dl were found in group I. In group II, total cholesterol reduced from 209.9 to 187.9 mg/dl, LDL-C 139.1 to 104.8 mg/dl and VLDL-C 35.6 to 32.3 mg/dl respectively but per cent decrease was significantly ( $P \leq 0.01$ ) higher compared to group II. A significant increase in HDL cholesterol from 37.3 to 58.5 mg/dl in group I and 35.1 to 50.9 mg/dl in group II was observed but percent increase in HDL-C was significantly ( $P \leq 0.01$ ) higher compared to group II patients. It is concluded that significant improvement in serum lipid profile of the diabetics can be achieved by using 2gm of powdered mixture of fenugreek, jambu and bitter guard in their daily diet.

Sasikala and Subapriya (2006) [43] supplemented a hypoglycemic food Mix made up of moringa leaves and fenugreek to a group of diabetic patients and observed that after supplementation a lot of patients moved in to ideal weight category, all clinical symptoms decreased to nil in the experimental group but persisted in control group. Moreover, there was a marked reduction in blood glucose and blood lipid profile levels in diabetic patients of experimental group.

**8. Watermelon:** Watermelon is the most frequently recommended fruit in all naturopathy centers under study. Habib *et al.* (2003) [8] investigated the glycemic, non-esterified fatty acid (NEFA) and insulinemic responses to watermelon and apple in 13 subjects (8male and 5 female) of type 2 diabetes by using white bread as the reference food. The study was carried out in a cross over design, where they consumed Equi carbohydrate amounts of the fruits and bread, with a run in period of 7 days between the consecutive items. The results suggest that:

- i) Equi-carbohydrate of apple, watermelon and white bread (WB) produce the similar glycemic response but WB showed lower insulin response where as apple and watermelon showed lower than WB but similar insulin response.
- ii) Water-melon and apple showed almost similar glycemic response reflected in their close glycemic index values (Apple  $94 \pm 19$ , water melon  $92 \pm 15$ )
- iii) Watermelon may have a beneficial effect on dyslipidemia as there was a lower NEFA response of watermelon as compared to apple and WB but the difference was not significant.

**9. Soybean:** German Medical Journal considers soybean with its low starch and high protein and with even high fat, valuable for diabetes. Ruhrar (1911) established that there was something in soybean, yet unidentified, which lowered the urinary sugar among diabetics. Soy lecithin contains choline which was found useful in preventing and treating neurological complications of diabetes. Use soybean in some form or the other like tofu, tempeh, soymilk, soya powder, soy bean sprouts, nuggets etc. (Bakhru, 2000)<sup>[6]</sup>.

**10. Lemon:** Lemon juice effectively changes the character of the consumers blood and there by helps retard diabetic tendencies (Dewan, 2000)<sup>[6]</sup>.

**11. Certain Vegetables:** All vegetables which contain less than 3% carbohydrates help in preventing and controlling diabetes. Lettuce, cucumber, Raddish leaves, bathua and spinach leaves fall in this category (Bakhru, 2000)<sup>[35]</sup>.

**12. Turnips:** This vegetable is very low in carbohydrate and has no starch. Its sugar can be reduced further by a few boilings and then it becomes a very useful food for diabetics (Dewan, 2000)<sup>[6]</sup>.

**13. Urad (Black gram):** Investigations conducted at the Central Food Technological Research Institute, Mysore, India showed that ingestion of urad dal with the usual diet helps to lower the blood sugar level. Milk made by grinding sprouted whole urad is also good for diabetic (Dewan, 2000)<sup>[6]</sup>.

**14. Bengal gram:** Extract of Bengal gram (Chana) e.g. soup etc help in utilizing the glucose in the body. Taking of the extract of chana has been known to reduce the intake of insulin by diabetics to almost half (Dewan, 2000)<sup>[6]</sup>.

**15. Banana:** June 16, 1934, issue of the Journal of American Medical Association says "Banana and skimmed milk furnish a simple and effective method for weight reduction in treating patient for diabetes." Unripe banana cooked as a vegetable is extremely good for diabetics (Dewan, 2000)<sup>[6]</sup>.

**16. Sauerkraut:** Sauerkraut prepared from cabbage is considered a very healthy food which cleanse the stomach thoroughly. It is used by many physicians to control diabetes (Dewan, 2000)<sup>[6]</sup>.

**17. Some Teas:** Parsley tea has been known to drop the sugar level to normal. Blueberry leaf tea is also useful for the diabetics. Tea made of tender walnut tree leaves is used in certain communities for controlling diabetes. Water in which kidney bean pods have been cooked is good for

diabetes (Bakhru, 2000)<sup>[35]</sup>.

**18. Almond meal:** Whatever is left of almond after extraction of oil is specially good for diabetes. It has no starch (Dewan, 2000)<sup>[6]</sup>.

**19. Yogurt:** Yogurt injects friendly bacteria in digestive system which stimulate pancreas to perform much better by removing its acids and wastes (Dewan, 2000)<sup>[6]</sup>.

**20. Butter milk:** Butter milk contains lactic acid, which influences secretion of pancreas and help control blood sugar levels (Dewan, 2000)<sup>[6]</sup>.

**21. Bael (Aegle Marmelos):** Bael juice (with out sugar) is a refreshing drink for diabetics. Its leaves can be chewed and dried pulp can be taken in the doses of 5 to 10 grams a day.

**22. Diabetes flour:** A mixture of various hypoglycemic whole grain cereals and lentils is used as flour to facilitate intake of all these on regular basis. e.g. flour made up of equal quantity of soybean, black gram(urad), jowar, bajra, Bengal gram (kala chana), wheat bran barley and half quantity of almond meal could be profitably used to make chapattis etc. Bread could even be baked from such a mixture (Dewan, 2000)<sup>[6]</sup>.

#### Intake of small meals for niddm management

To ensure gradual release of energy, diabetic should take small meals 5-6 times a day. Diabetic have a tendency for over eating and towards acidity because of slowed down protein and fat metabolism (Dewan, 2000)<sup>[6]</sup>.

Diabetics diet should, therefore, be alkaline and over-eating avoided (Bakhru, 2000)<sup>[35]</sup>.

#### Consultations

When diabetic try to control their blood sugar levels by food therapy, they should consult physicians frequently about their blood sugar levels to ensure that the blood sugar does not go below the desirable level (Dewan, 2000)<sup>[6]</sup>.

#### Conclusion

The Intensive study of all the therapies, strategies and techniques used at naturopathy revealed that naturopathy has an all round approach to support metabolic system of the human body to manage diabetes and can live a long risk free life free from severe symptoms and other complications of NIDDM.

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