Chapter-I

Introduction

The Sanskrit word yoga has the literal meaning of "yoke", or "the act of yoking or harnessing", from the root word yuj. In Vedic Sanskrit, the term "yoga" besides its literal meaning, the yoking or harnessing of oxen or horses, already has a figurative sense, where it takes the general meaning of "employment, use, application, performance" (compare the figurative uses of "to harness" as in "to put something to some use"). All further developments of the sense of this word are post-Vedic. A sense of "exertion, endeavor, zeal, diligence" is found in Epic Sanskrit. The more technical sense of the term "yoga", describing a system of meditation or contemplation with the aim of the cessation of mental activity and the attaining of a "supreme state" arises with early Buddhism (5th century BC), and is adopted in Vedanta philosophy by the 4th century BC.

There are a great many compounds containing yoga in Sanskrit, many of them are unrelated to the technical or spiritual sense. Yoga in these words takes meanings such as "union, connection, contact", or "method, application, performance", etc. For example, guna-yoga means "contact with a cord"; cakra-yoga has a medical sense of "applying a splint or similar instrument by
means of pulleys (in case of dislocation of the thigh)”; candra-yoga has the astronomical sense of “conjunction of the moon with a constellation”; pum-yoga is a grammatical term expressing "connection or relation with a man", etc.

Many such compounds are also found in the wider field of religion. Thus, bhakti-yoga means "devoted attachment" in the monotheistic Bhakti movement. The term kriya-yoga has a grammatical sense, meaning "connection with a verb". But the same compound is also given a technical meaning in the Yoga Sutras, designating the "practical" aspects of the philosophy, i.e. the "union with the Supreme" due to performance of duties in everyday life.

The more technical sense of the term "yoga", describing a system of meditation or contemplation with the aim of the cessation of mental activity and the attaining of a "supreme state" arises with early Buddhism. The Buddhist texts are probably the earliest texts describing meditation techniques altogether. (Gombrich, 1988). They describe meditative practices and states that existed before the Buddha, as well as those first developed within Buddhism (Wynne, 2007).
In Hindu scripture, this sense of the term "yoga" first appears in the middle Upanishads, such as the Katha Upanishad (ca. 400 BCE) (Nakamura, 1987). Shvetashvatara Upanishad mentions, "When earth, water fire, air and akasa arise, when the five attributes of the elements, mentioned in the books on yoga, become manifest then the yogi's body becomes purified by the fire of yoga and he is free from illness, old age and death." More importantly in the following verse it mentions, the "precursors of perfection in yoga", namely lightness and healthiness of the body, absence of desire, clear complexion, pleasantness of voice, sweet odour and slight excretions.

Early Buddhism incorporated meditative absorption states. The most ancient sustained expression of yogic ideas is found in the early sermons of the Buddha (Miller, 1996). One key innovative teaching of the Buddha was that meditative absorption must be combined with liberating cognition (Wynne, 2007). The difference between the Buddha's teaching and the yoga presented in early Brahminic texts is striking. Meditative states alone are not an end, for according to the Buddha, even the highest meditative state is not liberating. Instead of attaining a complete cessation of thought, some sort of mental activity must take
place: a liberating cognition, based on the practice of mindful awareness (Wynne, 2007).

Buddha also departed from earlier yogic thought in discarding the early Brahminic notion of liberation at death. (Wynne, 2007). Liberation for the Brahminic yogin was thought to be the realization at death of a nondual meditative state anticipated in life. In fact, old Brahminic metaphors for the liberation at death of the yogic adept ("becoming cool," "going out") were given a new meaning by the Buddha; their point of reference became the sage who is liberated in life (Wynne, 2007).

In Hindu philosophy, Yoga is the name of one of the six orthodox philosophical schools (Stiles, 2001). The Yoga philosophical system is closely allied with the Samkhya school. The Yoga school as expounded by the sage Patanjali accepts the Samkhya psychology and metaphysics, but is more theistic than the Samkhya, as evidenced by the addition of a divine entity to the Samkhya’s twenty-five elements of reality. The parallels between Yoga and Samkhya were so close that Max Müller says that "the two philosophies were in popular parlance distinguished from each other as Samkhya with and Samkhya without a Lord....". The intimate relationship between Samkhya and Yoga is explained by Heinrich Zimmer:
These two are regarded in India as twins, the two aspects of a single discipline. Sāṅkhya provides a basic theoretical exposition of human nature, enumerating and defining its elements, analyzing their manner of co-operation in a state of bondage ("bandha"), and describing their state of disentanglement or separation in release ("mokṣa"), while Yoga treats specifically of the dynamics of the process for the disentanglement, and outlines practical techniques for gaining of release, or "isolation-integration" ("kaivalya").

Patanjali is widely regarded as the founder of the formal Yoga philosophy. Patanjali's yoga is known as Raja yoga, which is a system for control of the mind. Patanjali defines the word "yoga" in his second sutra, which is the definitional sutra for his entire work:

Modifications (vṛtti) of the mind (citta)". The use of the word nirodhaḥ in the opening definition of yoga is an example of the important role that Buddhist technical terminology and concepts play in the Yoga Sutra. This role suggests that Patanjali was aware of Buddhist ideas and wove them into his system (Miller, 1996). Swami Vivekananda translates the sutra as "Yoga is restraining the mind-stuff (Citta) from taking various forms (Vrittis) (Vivekanada, 1996).
Patanjali’s writing also became the basis for a system referred to as "Ashtanga Yoga" ("Eight-Limbed Yoga"). This eight-limbed concept derived from the 29th Sutra of the 2nd book, and is a core characteristic of practically every Raja yoga variation taught today. The Eight Limbs are:

1. Yama (The five "abstentions"): non-violence, non-lying, non-covetousness, non-sensuality, and non-possessiveness.
2. Niyama (The five "observances"): purity, contentment, austerity, study, and surrender to god.
3. Asana: Literally means "seat", and in Patanjali’s Sutras refers to the seated position used for meditation.
4. Pranayama ("Suspending Breath"): Prana, breath, "ayama", to restrain or stop. Also interpreted as control of the life force.
5. Pratyahara ("Abstraction"): Withdrawal of the sense organs from external objects.
6. Dharana ("Concentration"): Fixing the attention on a single object.
7. Dhyana ("Meditation"): Intense contemplation of the nature of the object of meditation.
8. Samādhi ("Liberation"): merging consciousness with the object of meditation.
In the view of this school, the highest attainment does not reveal the experienced diversity of the world to be illusion. The everyday world is real. Furthermore, the highest attainment is the event of one of many individual selves discovering itself; there is no single universal self shared by all persons (Phillips, 1995).

Yoga is a scientific exploration of the inner self that eventually brings about a metamorphosis in the seeker and leads to self realization. The true essence of Yoga revolves around elevating the life force or ‘Kundalini’ at the base of the spine. Yoga is a leading light for a practitioner into gaining mastery over the self, and comprehending the purpose of birth.

To quote from Bhagavad-Gita, “A person is said to have achieved yoga, the union with the Self, when the perfectly disciplined mind gets freedom from all desires, and becomes absorbed in the Self alone”.

As man is a physical, mental and spiritual being, yoga helps to promote a balanced development of all the three stated above. Physical exercises, aerobics and other forms of exercises assure welfare only to the physical body. It has little to do with the development of the spiritual body or the astral body.

Yogic exercises help to promote an all-round well being in an individual. They help to recharge the body with cosmic energy.
This helps to attain perfect equilibrium and harmony. Yoga helps the aspirant to channelize and harness the cosmic energy for self-healing. Consequently, it produces peace and positive feelings in the mind of the aspirant. It rejuvenates and energizes the body. Development and healing is brought about from within.

In daily life, yoga helps the person to attain a relaxed state of mind. It provides him with vitality, vigor and zest to carry out his life. All negative blocks in the mind are removed. The body is cleansed of all the impurities and toxins.

Personal power is enhanced by the practice of yoga. One learns to identify their own inner resources and draw upon the energy needed from their own inner sources. It helps one to increase his or her awareness, i.e. self-awareness. It helps in attention focus and concentration. Children do better in their studies, if yoga practice is inculcated into their daily routine. The whole science of yoga has one view in common-to gain health, personal power, to develop knowledge and attain peace of mind. It also reduces stress, tension in the physical body, activates the parasympathetic nervous system.

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Diabetes is a chronic disease that occurs when the pancreas does not produce enough insulin, or when the body cannot effectively use the insulin it produces. Hyperglycaemia, or raised blood sugar, is a common effect of uncontrolled diabetes and over time leads to serious damage to many of the body’s systems, especially the nerves and blood vessels (WHO, 2011).

**Diabetes**

Diabetes mellitus represents a cluster of metabolic diseases characterized by high levels of blood glucose (hyperglycemia). This may be as a result of defects in insulin secretion, insulin action or both. Insulin is a hormone secreted by beta cells of islets of
langerhans, situated in pancreas. The glucagons produced by alfa cells have anti-insulin action. Both in unison keep a constant glucose level in the blood. Insulin also acts as gate keeper, where, only in its presence can the blood glucose enter the body cells and provide fuel and energy to work. In diabetes, the cellular fuel is thus compromised, while excess of glucose remains in the circulation.

**Types of Diabetes**

Type 1 diabetes is a disease resulting from absolute insulin deficiency, usually caused by autoimmune destruction of pancreatic islet cells. The initial clinical presentation may be ketoacidosis with an acute illness, or a more gradual presentation with symptoms of hyperglycemia. Other autoimmune disorders may also be present such as Addison’s disease, thyroiditis, and pernicious anemia. A small subset of patients with type 1 diabetes have a non-immune mediated disease process with a waxing and waning clinical course. This form of type 1 diabetes is strongly inherited and most commonly affects persons of African and Asian descent.

Type 2 diabetes is a disease resulting from a relative, rather than an absolute, insulin deficiency with an underlying insulin resistance. Type 2 diabetes is associated with obesity, age, and
physical inactivity. Patients with type 2 diabetes are not prone to ketoacidosis, frequently do not require insulin, and may be asymptomatic, despite being hyperglycemic for many years.

Gestational diabetes (GDM) is diabetes or any degree of glucose intolerance that is diagnosed during pregnancy. Detection, diagnosis and treatment of gestational diabetes are discussed in Section 10, “Gestational Diabetes.”

**Other CAUSES of diabetes**

There are not classified as either type 1 or type 2 include: genetic defects of islet cell function; genetic defects in insulin action; endocrinopathies such as Cushing’s disease or syndrome; drug- or chemical-induced hyperglycemia; infections; and insults to the pancreas from a variety of causes such as pancreatic cancer, cystic fibrosis, trauma, and pancreatitis.

Diabetes Mellitus is a disease related to the impaired glucose tolerance of the body, insulin functioning is affected. Symptoms of diabetes can be excessive thirst, excessive hunger or excessive / frequent urination.

Diabetes Mellitus can be of Type 1 or Type 2 or pancreatic diabetes or gestational diabetes.
Type 1 diabetes is caused by No production of insulin and this is very difficult to treat with Yoga. Type 2 diabetes which is caused by life style, stress related diseases can be effectively treated with Yoga.

**Yogaasamn and Diabetics**

**Sun Salutation**

Sun Salutation is very good exercise for people suffering from diabetes, it increases the blood supply to various parts of body, improving insulin administration in the body, it gives all the benefits of exercise if practiced at 4 rounds per minute. If practiced at slow speed, it offers the benefits of asanas.

**Asanas**

Asanas are beneficial in treatment of diabetes. Important aspect of Asanas is stability and comfort experienced in the position. After attaining the position, one needs to relax all the muscles and try to maintain the positions for long. Due to various twists, stretches and strains in the body, the internal organs are stretched and subjected to strain. This increases the blood supply, oxygen supply to the organs increasing the efficiency and functioning of the organ. Stretching various glands result in increased efficiency of the endocrine system. Asanas like Dhanurasana (Bow pose in prone position), Ardhamatsyendrasana (Half spinal twist), Vajrasana Yoga Mudra,
Pavan Muktasana, Sarvangasana, Halasana, Matsyasana have been found useful in diabetes. These asanas have positive effect on pancreas and also insulin functioning. But to get this result, one needs to maintain the asana for longer duration while relaxing the muscles.

**Pranayama**

There are 8 types of Pranayama mentioned in Hatha Yoga. One of the basic preparations for Pranayama is Nadi Shodhan Pranayama or alternate nostril breathing, this type is found useful in diabetes as Alternate nostril breathing has calming effect on nervous system, which reduces stress levels, helping in diabetes treatment. Also research has shown that Bhramari and Bhasrika Pranayama help in diabetes. Bhramari has calming effect on mind, brain and nervous system. Bhasrika Pranayama is revitalizing Pranayama, which increases oxygen levels and reduces carbon dioxide levels in the blood. In bhasrika Pranayama, the abdominal muscles and diaphragm are used which puts pressure on the internal organs. But before practicing these Pranayama, one must learn and practice deep breathing, fast breathing, alternate nostril breathing, Bandhas (Jalandhar bandha or chin lock, moola bandha and Uddiyan bandha or abdominal lock) from expert Guru.
Meditation

Practice of meditation is especially useful in management of stress. Relaxed and Concentrated state of mind is the aim of any form of meditation which creates calming effect on nervous system, brings balance between Sympathetic and Parasympathetic nervous systems. Initially meditation may be difficult, and one can practice Omkar Chanting, concentration on breathing. Especially for diabetes, concentration on pancreas during the meditation practice has shown positive effects on sugar levels. One can even visualize the proper functioning of pancreas, proper insulin administration in the body can help in treatment of diabetes.

Yoga Nidra

Yoga Nidra is very important process of deep relaxation; it helps alleviate the stress and has very good positive effects on the entire body - mind complex.

Cleansing Processes

Master cleansing or Shankha Prakshalana is recommended for diabetes, complete Shankha Prakshalana takes 1 day and is recommended once in 6 months, but smaller version of it can be done 3 times a week. This process cleanses the Gastro Intestinal tract completely. This process is done by drinking 2 glasses of
warm, salty water and lemon juice is added to it. Then performing 6 different exercises, this exercises speed up the peristaltic movements and one needs to evacuate bowels. In 2 hours about 7 to 8 bowels are completed till the clear water is evacuated (www.yogapoint.com).

There are several ways of yoga can be beneficial in controlling diabetes. If medically prescribed regimens are followed by diabetic students, they can safely add yoga to their treatment. Due to the potential impact on their glucose levels, and overall body function, great strides can be made through regular committed yoga practice.

**Benefits of yoga**

The benefits of yoga on circulation are tremendous. This is one of the reasons yoga is so healthy for people suffering from a variety of ailments. Circulatory problems, in diabetics, are the primary cause of many devastating side effects. Yoga’s focus on breathing, stretching and rotational movements, by nature, improves circulation.

Yoga also helps maintain the elasticity of blood vessels. This further assists in good circulation. In turn, increased oxygen is supplied to internal organs and the important glands of the endocrine system. When the blood vessels remain elastic, this means better heart health and decreased risk of stroke.
Back bends are especially good for the cardiovascular system. Yoga teachers should encourage diabetic students to incorporate back bends into their postures. If a student has mobility problems, because of age or obesity, consider assisted back bends with props to support his, or her, body, neck, and head.

Digestion is improved through movements and breath control of yoga (pranayama). Pancreas and liver operation is also enhanced. The rotations of certain postures also massage the glands of the endocrine system, encouraging hormone production.

Diabetics, who commit to the regular practice of yoga, will likely experience less dependence on insulin. Studies have found that significant drops in the average blood glucose levels occur in type II diabetics, when they practice yoga on a regular basis. Additional findings demonstrate an increase in nerve function.

Neuropathy is another major complication of diabetes. Neuropathies are family of nerve disorders that often result in numbness, tingling, and sometimes, pain. Yoga has been shown to help prevent the onset of neuropathy. In diabetics with subclinical neuropathy, yoga can relieve symptoms.

Not least important is the stress reduction power of yoga. Through focus on breathing slowly, and deliberately, stress levels are reduced. Glucagon secretion is enhanced by stress, which
raises the blood sugar. Through effective stress management, and increased balance in the body, this can be prevented and reversed.

The following sequences and poses are beneficial to diabetic students:

1. Sun Salutations - This sequence of poses is great for diabetics. The flowing series of movements increases blood flow to all parts of the body, improving insulin administration.

2. Peacock Pose (Mayurasana) - The peacock pose is said to tone up the pancreas, kidneys, and liver. Improved digestion is another benefit.

3. Locust Pose - The locust benefits the nerves by reducing tension. The constriction and release, in the muscles of the back, relaxes muscles. The movement also stimulates the pancreas.

4. Chest-Knee Pose - Also called the Knees to Chest pose, this posture provides a great deal of support for digestion. The lower digestive tract is soothed and stimulated by this posture. Lower back pain is also relieved by the stretching of those muscles. It reduces tension.
5. The Cobra Pose, Bow Pose, Leg Lift and Half-Moon pose are also recommended. Try abdominal pumping as a part of the student's regimen to further stimulate the organs.

6. Diabetic students must remember that yoga is more than just exercise. In addition to breathing control, and muscle stretching, yoga includes behavioral modifications, and diet control, through mental discipline. The positive effects of the physical strength must be tempered with enhanced mental will power. The best benefit of regular yoga practice is an increase in quality of life and happiness.

Regular practice of yoga does reduce blood sugar levels, the blood pressure, weight, the rate of progression to the complications, and the severity of the complications as well. The symptoms are also reduced to a great extent, so are number of diabetes related hospital admissions. The quality of life questionnaires do reveal a remarkable improvement in the scores. These finding are uniform for all those who are trying to find effect of yoga on diabetes.
Possible Mechanisms of Yoga

1. Glucagon secretion is enhanced by stress. Yoga effectively reduces stress, thus reducing glucagons and possibly improving insulin action.

2. Weight loss induced by yoga is a well accepted mechanism.

3. Muscular relaxation, development and improved blood supply to muscles might enhance insulin receptor expression on muscles causing increased glucose uptake by muscles and thus reducing blood sugar.

4. Blood pressure plays a great role in development of diabetic and related complications, which is proven to be benefited by yoga. The same holds true for increased cholesterol levels.

5. Yoga reduces adrenaline, noradrenalin and cortisol in blood, which are termed as ‘stress hormones’. This is a likely mechanism of improvement in insulin action.

6. Many yogic postures do produce stretch on the pancreas, which is likely to stimulate the pancreatic function.

In India, we are having many patients controlled only on so called ‘lifestyle modification’ i.e. yoga essentially. Human beings
are also trying to recruit many ‘impaired glucose tolerance’ patients (Pre-diabetic patients, as suggested by clinical and laboratory evaluations) in our ‘Prevention of Diabetes - Yoga Way Programme’ (PDYW) (www.yogapoint.com).

**Need of Biochemical variables**

Higher level of circulating lipids in blood than normal levels may be considered as Hyperlipidemia and epidemiological studies intricate a general trend towards a greater incidence of Atherosclerosis and incidence of Cardio Vascular Disease among people with Hyperlipidemia.

The circulating lipids in the blood may be categorized into five types of lipoproteins according to density, composition and size, as Very Low Density Lipoproteins (VLDL), Low Density Lipoproteins (LDL), Intermediate Density Lipoproteins (IDL) and High Density Lipoproteins (HDL) and Chylomicrons. Again there are subfractions in HDL like HDL-1, HDL-2, HDL-3. Total cholesterol is the sum total of cholesterol carried by VLDL, LDL, HDL and chylomicrons. The percentage of LDL is most significant that the total cholesterol level as a risk factor in the development of CHD, because this substance involves in the development of the atherosclerotic plaque in the blood vessels. Incidentally, the HDL Cholesterol, which contains and enzyme called 'Lecithin
Cholesterol Acid Transfers (LCAT), retards the development of atherosclerosis by gathering free cholesterol and transporting it to the liver and which will be released as cholesterol in the bile or is converted to bile salts. HDL acts as a reverse cholesterol transfer system that resists the development of atherosclerosis.

Indeed, a low HDL cholesterol concentration has been shown to be the most prevalent abnormality of the lipoprotein lipid profile reported among men with documented CHD. The results of the Veterans Affairs High Density Lipoprotein Interaction Trial (VA-HIT) study clearly showed that, pharmacotherapy aimed at increasing plasma HDL cholesterol levels reduces the risk of CHD, even in the absence of any change in plasma LDL cholesterol levels; this latter finding is commonly observed when CHD patients with low HDL cholesterol levels are treated with a fibrate such as Gembibrozil.

**Statement of the Problem**

The present study was designed to find out the effect of yoga practices on selected physiological and biochemical variables among the diabetic patients, such as breath holding time, resting pulse rate, respiratory rate, high density lipoproteins cholesterol (HDL), low density lipoproteins cholesterol (LDL) and very low density lipoproteins cholesterol (VLDL) of diabetic patients.
Hypotheses

It has been scientifically accepted that any systematic training over a continuous period of time would lead to produce changes in human beings. Based on this concept, the following hypotheses were drawn.

1. There may be significant improvement on breath holding time due to the effect of yoga practices with different frequencies.

2. There may be significant difference on breath holding time among the selected groups.

3. There may be significant decrease on resting pulse rate due to the effect of yoga practices with different frequencies.

4. There may be significant difference on resting pulse rate among the selected groups.

5. There may be significant decrease on respiratory rate due to the effect of yoga practices with different frequencies.

6. There may be significant difference on respiratory rate among the selected groups.
7. There may be significant increases on high density lipoproteins cholesterol (HDL) due to the effect of yoga practices with different frequencies.

8. There may be significant difference on high density lipoproteins cholesterol (HDL) among the selected groups.

9. There may be significant reduction on low density lipoproteins cholesterol (LDL) due to the effect of yoga practices with different frequencies.

10. There may be significant difference on low density lipoproteins cholesterol (LDL) among the selected groups.

11. There may be significant reduction on very low density lipoproteins cholesterol (VLDL) due to the effect of yoga practices with different frequencies.

12. There may be significant difference on very low density lipoproteins cholesterol (VLDL) among the selected groups.
Delimitations

1) To achieve the purpose of the study, forty five men diabetic patients from Erode district, Tamilnadu India were selected as subjects.

2) The age of the subjects ranged from 40 to 50 years.

3) The subjects were divided at random into three groups of fifteen each (n=15). Group I underwent yoga practices three days per week, group II underwent yoga practices five days per week and group III acted as control.

4) The duration of the training period was restricted to twelve weeks.

5) The dependent variables breath holding time, resting pulse rate, respiratory rate, High Density Lipoproteins Cholesterol (HDL), Low Density Lipoproteins Cholesterol (LDL) and Very Low Density Lipoproteins cholesterol (VLDL) were selected for this study.

6) The selected criterion variables for the study were assessed by the following standardized test items: breath holding time was assessed by manual method, resting pulse rate was assessed by radial pulse method, respiratory rate was assessed by
manual method, High Density Lipoproteins Cholesterol (HDL) was assessed by enzymatic colorimetric method, Low Density Lipoproteins Cholesterol (LDL) was assessed by Friedewald, Levy and Fredrickson (1972) equation method and Very Low Density Lipoproteins Cholesterol (VLDL) was assessed by formula method.

7) Biochemical variables were assessed in the clinical laboratory in Raja Medical Centre in Erode, Tamilnadu, India.

8) The data were collected prior to and immediately after twelve weeks of training.

**Limitations**

The following limitations were considered while interpreting the results of the study.

1) The environmental factor such as, climatic condition, atmospheric pressure, temperature and humidity during the training period and collection of data were not taken into consideration.

2) The previous experience of the patients in the training was not considered in this study.
3) Psychological factors, food habits, rest period, life style etc., could not be controlled.

4) Though the subjects were motivated verbally no attempt was made to differentiate the motivation levels during the period of training and testing.

5) While training and testing periods, the factors like personal habits life style and other domestic involvements of the subjects which may influence the results of the study were not taken into consideration.

**Definition of the Operational Terms**

**Yogasana**

The word "yoga" comes from the Sanskrit root "yuj", which means "to join" or "to yoke". Yoga is a practical aid, not a religious practice. Yoga is an ancient art based on a harmonizing system of development for the body, mind, and spirit. The continuous practice of yoga will lead to a sense of peace and well-being, and also a feeling of being at one with their environment. This is a simple definition about yoga ([Iyengar, 2001](#)).
**Training Frequency**

Frequency of training is measured as the number of training sessions for a given muscle group or lift per unit of time (Poliquin, 2011).

**Breath holding time**

It is the duration of time through which one can hold his breath without inhaling or exhaling after a deep inhalation. (Stukia, 1981).

**Resting Pulse Rate**

The resting pulse rate as the distension of the arterial walls at the beginning of the systolic injection of blood which is not confined to aorta but travels down the arteries that lie close to the body such as radial artery of the wrist, the arrival of the wave of distension and subsequent recoil may be felt as a distinct throb pulse which offers a conventional method of counting the pulse rate (Morehouse and Miller, 1976).

**Respiratory Rate**

It is the number of breaths taken in a minute or number of inspirations / expirations in a minute (Fox and Mathews, 1981).
**High Density Lipoproteins Cholesterol (HDL)**

HDL Cholesterol a type of protein molecule carried in the blood that removes Cholesterol from tissues and appears to protect against coronary heart disease. Reduces the development of atheroma and atherosclerosis. HDL was estimated by Phophotungstate method and it is expressed as mg/dl.

HDL Cholesterol is a group of protein found in the blood plasma and limph that are combined with lipids. They transport cholesterols from the tissue the liver to be broken down and excreted HDL cholesterol is called “Good Cholesterol”.

**Low Density Lipoproteins Cholesterol (LDL)**

LDL Cholesterol is a specific kind of lipoprotein that is the form in which cholesterol is transported in the blood. LDL Cholesterol is called “Bad Cholesterol”.

Low Density Lipoprotein Cholesterol is the major cholesterol carrying lipoprotein. Elevated LDL levels herald a strong predisposition to Coronary Heart Disease, stroke and peripheral vascular disease. LDL was calculated using Priedwalad’s equation and expressed as mg/dl.
**Very Low Density Lipoproteins Cholesterol (VLDL)**

VLDL- Cholesterol is specific kind of lipoprotein when found in excess in the blood. It is through to increase the risk of author sclerosis by carrying cholesterol to the tissue.

The VLDL contains the greatest percentage of lipid(95%) of which about 60% is in the form triglyceride. These lipoproteins transports to muscle and adipose tissue the triglycerides formed in the liver from lipids, carbohydrates, alcohol and cholesterol. VLDL is TG/5 and expressed as mg/dl.

**Significance of the Study**

1) The study will help the diabetic patient to improve their physical fitness and control the biochemical parameters.

2) The study will help many to avoid medicines to make them fit but to maintain one’s own physical health.

3) More constructive evidence will be available regarding the effect of various selected exercises or protocols of conditioning on the status of the selected risk factors, that cause or precipitate the occurrence of the diseases like coronary heart disease, atherosclerosis of small blood vessels etc.,
4) This study also creates a path to conduct several researches in the same direction and area with different experimental variables and with different combinations of variables on the risk factors of various diseases.

5) This study will create significant health awareness among middle age diabetic patient.