

Chapter – II

REVIEW OF RELATED LITERATURE

Yoga is an ancient Indian traditional science and it has deep root in Indian culture and traditional education. In recent days, yoga has been accepted as an applied science in maintaining good health, fitness and peaceful life. Such an acceptance of yoga among the people of worldwide nations is based on the findings of many scientific researches. Kaivalyadhama Yoga Institution (Lonavla, India) is the first in the world, which brought traditional yoga in to a scientific laboratory under the guidance of Swami Kuvalayananda (the founder Director of Kaivalyadhama) and has been scientifically studying since 1924 its favourable effects for human health, fitness, education, life and living. A study of relevant literature is an essential step to get a good comprehension of what has been done with regard to the problem under study. Today many scientists around the globe are conducting researches and some of the glimpses of research findings have been presented in this Chapter to justify this piece of research. A study of relevant literature is an essential step to get a good comprehension of what has been done with regard to the problem under study.

The researcher has gone through available journals, books, magazines, articles, research papers and literature which is relevant to the study are presented in this chapter. Review of literature has been confined to the libraries of Tamilnadu Physical education and Sports University, Chennai, Annamalai University, Pondicherry University, Puducherry. The reviews of the literature have been classified under the following headings and arranged as per chronological order.

1. Studies related to Diabetes mellitus
2. Studies related to Bio-Chemical variables
3. Studies related to Psychological variables
4. Studies related to yogic training on Bio chemical variables of diabetes mellitus patients
5. Studies related to yogic training on psychological variables of diabetes mellitus patients
6. Summary of the literature.

The purpose of the study is to analyse the effect of integrated modulus of the yogic practices on selected bio-chemical and psychological variables among Middle aged Diabetic men II. There are number of studies touching the topic that has been perused and some of the most important reviews were presented in this chapter for clear understanding.

2.1 STUDIES RELATED TO DIABETES II MELLITUS

Ravi Prakash Upadhyay, et. al., (2013) the authors reviewed studies from 2000 to 2011 that documented the prevalence of diabetes mellitus in various tribal populations of India. The search was performed using electronic and manual methods. Meta-analysis of data on point prevalence was performed. A total of seven studies were retrieved. The prevalence of diabetes mellitus ranged from 0.7% to 10.1%. The final estimate of diabetes prevalence obtained after pooling of data from individual studies, was 5.9% (95% CI; 3.1-9.5%). The prevalence for impaired fasting glucose (IFG) varied from 5.1% to 13.5% and impaired glucose tolerance (IGT), from 6.6% to 12.9%. Chronic disease research in tribal populations is limited. The reported prevalence of IFG/IGT was higher than the prevalence of diabetes and this observation

could be suggestive of a potential increase in diabetes in the coming years. Given that lifestyle changes have occurred in the tribal populations, there is a need to synthesize evidence(s) relating to diabetes and other chronic diseases in these marginalized populations and inform policy makers.

Reshma S Patil, Jayashree, S., Gothankar, (2013) the study conducted to find the prevalence of known cases of diabetes in urban slum of Pune city and its association with risk factors. A cross sectional study was conducted in field practice area of Urban Health Training Center in the age group of 20 years and above comprising of total 1779 subjects. Risk factors like age, waist circumference, and family history of diabetes and physical activities were assessed to find their association with diabetes. The Prevalence of type 2 Diabetes Mellitus found in present study was 4.6% with equal prevalence in both the sex. Higher prevalence of diabetes in males was found in the age group of >60 years while in females prevalence has occurred a decade earlier i.e. in 51-60 years. Abdominal obesity in females, family history of diabetes were found positively associated with diabetes while there was no significant association found between diabetes and physical activity. Awareness regarding risk factors in community is necessary for control of diabetes in known cases of diabetes and for early diagnosis in future cases.

Dharamvir Ranjan Bharati, et. al., (2011) this was a population-based cross-sectional study carried out between May 2007 and November 2007, in the rural and urban field practice area of Mahatma Gandhi Medical College and Research Institute, Puducherry. Simple random sampling technique was used for the selection of 1370 adult 20 years of age and above. Main outcome measures were the assessment of the prevalence of prevalence and correlates of diabetes among the adult population.

Pre-designed and pre-tested questionnaire was used to elicit the information on family and individual socio-demographic variables. Height, weight, waist, and hip circumference, blood pressure was measured and venous blood was also collected to measure fasting blood glucose, blood cholesterol. Overall, 8.47% study subjects were diagnosed as diabetic. The univariate analysis and multivariate logistic regression analysis showed that the important correlates of diabetes mellitus were age, blood cholesterol, and family history of diabetes. The findings were found to be statistically significant. In the study it was observed that adults having increased age, hypercholesterolemia, and family history of diabetes mellitus are more likely to develop diabetes mellitus.

Misra, P., et. al., (2011) describes the extent of problem of diabetes in rural India based on review of available literature and examines the secular trends over a period of 15 years i.e. from 1994 to 2009. A systematic search was performed using electronic as well as manual methods. Studies providing details of sample size, age group of participants, criteria used for diagnosis, along with the prevalence of any of the three outcomes of interest i.e. diabetes mellitus, impaired fasting glucose (IFG) or impaired glucose tolerance (IGT), were included. Analysis of secular trends reveals an increase in diabetes prevalence among rural population at a rate of 2.02 per 1000 population per year. The rate of increase was high in males (3.33 per 1000 per year) as compared to females (0.88 per 1000 per year). High prevalence of IFG and IGT has been observed in southern and northern parts of the country. The prevalence of diabetes is rising in rural India. There is a large pool of subjects with IFG and IGT at high risk of conversion to overt diabetes. Population-level and individual-level measures are needed to combat this increasing burden of diabetes.

Puri, S., et. al., (2006) the cross-sectional study was done in Department of Community Medicine of Govt. Medical College Chandigarh. A pre structured retested proforma was used to get detailed information regarding demographic profile, chief complaints, co-morbidities, and treatment of the elderly. Out of 74 patients 40 (54.1%) presented with some sign / symptom for which FBS was done and the patient was found diabetic. 18 (24.6%) were diagnosed on routine investigation and rest 16(21.6%) accidentally. The most common risk factor found in our study for diabetes was sedentary life style 35 (47.3%). Among the co-morbidities, 31 (41.9%) had hypertension while 21(28.1%) had CVD. Polyurea was found to be the most common presenting complaint. The lifestyle changes are required to avoid diseases like diabetes and patients need continuous motivation to continue diabetic treatment and dietary restriction. There is a need to have a holistic and multidisciplinary approach for management of elderly diabetes.

Peter Sonksen, Charles Fox and Sue Judd, (2004) diabetes at your fingertips, opens with description of how someone with diabetes might feel before the condition was diagnosed and treatment. Once the treatment has been started, people with diabetes should feel perfectly well, they also make the point that older people may have diabetes and yet feel quite well in themselves. In this case the condition will be discovered only if they have a routine blood or urine test for glucose, and diabetes may therefore exist for many years without being discovered. Unfortunately undetected diabetes may, over a long period, lead to complications affecting eyes, nerves and blood vessels.

Swami Shankardevananda (2002) stated that psychological factors such as —prolonged sorrow□ can be the cause of diabetes, this side of the problem is probably

the least well understood. Although we know that diabetes is related to lack of insulin, caused either by its non production or reduced production, or by its decreased or mistimed secretion, the original cause may not be in the pancreas at all. We know that emotional and mental disturbance create autonomic nervous system, endocrine gland and metabolic imbalance via the limbic system in the brain and this appears to be major factor in diabetes, especially the maturity onset form. Stress and tension cause increased activity of the sympathetic nervous system and adrenal glands, which inhibits insulin secretion. Ongoing stress and tension are, therefore, important factors in diabetes.

Harris (1998) Type 2 diabetes mellitus is usually associated with age and obesity, typically being diagnosed among middle-age and older adults. In fact, recent epidemiological studies have shown a clear relationship between age and prevalence of type 2 diabetes in the United States. Approximately 11% of individuals age 65 and older and 6% of those 45-64 years old have diabetes, while only 1.5% among those aged 18-44 years are affected by the illness.

Chen, H. D., et. al., (1998) the aim of this study was to determine the prevalence of diabetes mellitus and impaired glucose tolerance (IGT) in three different ethnic groups in eastern Taiwan. The study was performed among Han Chinese, aboriginal Ami and aboriginal Atayal in six rural villages. Inhabitants aged 40 years and over were invited to participate. A 75-g oral glucose tolerance test (OGTT) was used as suggested by the World Health Organization (WHO) for population screening purposes. WHO criteria were used for determining the results. A total of 1013 adults (460 men and 553 women) were examined with a response rate of 62.1%. There were no significant differences in sex, age and history of diabetes between responders and

non-responders. The age-adjusted prevalence of diabetes was 11.0% (9.8% in men and 12.3% in women) in the Chinese, 9.1% (12.1% in men and 7.4% in women) in the Amis, 10.8% (11.5% in men and 9.4% in women) in the Atayal and 9.9% (11.5% in men and 8.5% in women) for the two aboriginal groups together. Although sex differences in prevalence of diabetes were not statistically significant, it seems that diabetes was slightly more prevalent in Chinese women than in Chinese men (12.3 versus 9.8%). Nonetheless, the prevalence rate of diabetes was somewhat higher in the aboriginal males than in the aboriginal females (12.1 versus 9.8% for Ami and 11.5 versus 10.7% for Atayal). The prevalence of IGT was 7.2, 8.5, 10.8 and 9.7% for the Chinese, Amis, Atayal and the two aboriginal groups, respectively. There were no substantial differences in the prevalence of diabetes and IGT among these three ethnic groups. Environment, rather than ethnicity, was more likely the predominant factor. It was found that the prevalence of diabetes in this study was about twice as high as that reported in a 1987 survey in Taiwan.

2.2 STUDIES RELATED TO BIO-CHEMICAL VARIABLES

Calbet, et.al., (2006) studied an acute reduction of blood hemoglobin concentration (Hb), even when the circulating blood volume is maintained, results in lower (VO_2 max) and endurance performance, due to the reduction of the oxygen carrying capacity of blood. Conversely, an increase of [Hb] is associated with enhanced (VO_2 max) and endurance capacity, that is also proportional to the increase in the oxygen carrying capacity of blood. The effects on endurance capacity appear more pronounced and prolonged than on (VO_2 max). During sub maximal exercise, there is a tight coupling between (O_2) demand and (O_2) delivery, such that if [Hb] is acutely decreased muscle blood flow is increased proportionally and vice versa.

During maximal exercise with either a small or a large muscle mass, neither peak cardiac output nor peak leg blood flow are affected by reduced [Hb]. An acute increase of [Hb] has no effect on maximal exercise capacity or (VO_2 max) during exercise in acute hypoxia. Likewise, reducing [Hb] in altitude-acclimatized humans to pre-acclimatization values has no effect on (VO_2 max) during exercise in hypoxia.

Shaw, et. al., (2006) studied the clinical trials have shown that exercise in adults with overweight or obesity can reduce bodyweight. There has been no quantitative systematic review of this in The Cochrane Library. To assess exercise as a means of achieving weight loss in people with overweight or obesity, using randomized controlled clinical trials. Studies were obtained from computerized searches of multiple electronic bibliographic databases. The last search was conducted in January 2006. Studies were included if they were randomized controlled trials that examined body weight change using one or more physical activity intervention in adults with overweight or obesity at baseline and loss to follow-up of participants of less than 15%. Two authors independently assessed trial quality and extracted data. The 43 studies included 3476 participants. Although significant heterogeneity in some of the main effects' analyses limited ability to pool effect sizes across some studies, a number of pooled effect sizes were calculated. When compared with no treatment, exercise resulted in small weight losses across studies. Exercise combined with diet resulted in a greater weight reduction than diet alone. Increasing exercise intensity increased the magnitude of weight loss. There were significant differences in other outcome measures such as serum lipids, blood pressure and fasting plasma glucose. Exercise as a sole weight loss intervention resulted in significant reductions in diastolic blood pressure, triglycerides and fasting glucose. Higher

intensity exercise resulted in greater reduction in fasting serum glucose than lower intensity exercise. No data were identified on adverse events, quality of life, morbidity, costs or on mortality. The results of this review support the use of exercise as a weight loss intervention, particularly when combined with dietary change. Exercise is associated with improved CV risk factors even if no weight is lost.

Mahmoud (1996) examined the effect of prolonged sub maximal exercise followed by a self-paced maximal performance test on cholesterol (T-Chol), triglycerides (TG), and high-density lipoprotein cholesterol (HDL-C). Nine trained male athletes cycled at 70% of maximal oxygen consumption for 60 min, followed by a self paced maximal ride for 10 min, venous blood samples were obtained at rest, at 30 and 60 min during sub maximal exercise, and immediately after the performance test. Lactic acid, haematocrit (Hct), hemoglobin (Hb), Total Cholesterol and TG were measured in the blood, while plasma was assayed for HDL-C. Plasma volume changes in response to exercise were calculated from Hct and Hb values and all lipid measurements were corrected accordingly. In order to ascertain the repeatability of lipid responses to exercise, all subjects were re-tested under identical testing conditions and experimental protocols. When data obtained during the two exercise trials were analysed by two-way ANOVA no significant differences between tests were observed at 0.05 level. Consequently the data obtained during the two testing trials were pooled and analysed by one-way ANOVA. Blood lactic acid increased non significantly during the prolonged sub maximal test, but rose markedly following the performance ride. Lipid variables ascertained at rest were within the normal range for healthy subjects. ANOVA showed that blood T-Chol and TG were unchanged ($P > 0.05$), whereas HDL-C rose significantly ($P < 0.05$) in response to exercise. Post hoc

analyses indicated that the latter change was due to a significant rise in HDL-C after the performance ride. It was concluded that apparent favorable changes in lipid profile variables occur in response to prolonged sub maximal exercise followed by maximal effort, and these changes showed a good level of agreement over the two testing occasions.

Nieman, et. al., (1993) studied the relationship between cardio respiratory exercise and serum lipid and lipoprotein levels that was studied in elderly women. Randomized controlled experimental design with a follow up of 12 weeks: cross-sectional comparison at baseline. Community living elders in University exercise facilities. Thirty-two apparently healthy, sedentary elderly Caucasian women, 67 to 85 years of age. Ten highly conditioned elderly women, 65 to 84 years of age, who were active in endurance competitions and has been training for 11.2 +1.2 years were recruited at baseline for cross-sectional comparisons. Sedentary subjects were randomized to either a walking or calisthenics group. Intervention groups exercised 30 to 40 minutes, 5 days a week for 12 weeks, with the walking group training at 60% heart rate reserve and the calisthenics group engaging in mild range-of-motion and flexibility movements that kept their heart rates close to resting levels. Serum lipids and lipoproteins, maximal aerobic capacity (VO₂ Max), four skin folds, and dietary intake at baseline and after 5 and 12 weeks. When the highly conditioned serum and combined group of sedentary subjects were compared at baseline, serum high-density lipoprotein cholesterol (HDL-C; 1.61 + 0.14 Vs 1.27 + 0.05 mmol/L respectively: P=0.02), but not total serum cholesterol (5.72 + /0.36 Vs 5.72 +/-0.19 mmol/L, respectively) and low density lipoprotein cholesterol (LDL-C: 3.62+0.36 Vs 3.72 +/-0.18 mmol /L respectively, were significantly different. Twelve weeks of moderate

cardio respiratory exercise improved the VO₂ Max of the sedentary subjects 12.6% but did not result in any change in body weight, energy intake, dietary quality, or any of the serum lipids or lipoprotein. Highly conditioned and lean elderly women, when compared with their sedentary counterparts, had higher HDL-C and lower glycerides, but similar total serum cholesterol and LDL-C values. However, twelve weeks of moderate cardio respiratory exercise were not associated with an improvement in serum lipid or lipoprotein profiles in previously sedentary elderly women.

Aellen, et. al., (1993) studied the effects of aerobic and anaerobic training on lipoprotein concentrations in 45 healthy untrained men. Thirty three subjects exercised four times per week during nine weeks on a bicycle ergo meter. Sixteen trained with an intensity above the anaerobic threshold (blood lactate concentration > 4 mmol. l⁻¹) and 17 trained with an intensity below the anaerobic threshold. In addition, twelve subjects served as controls. The calculated caloric expenditure of the two training groups was similar. In all three groups, total cholesterol, total high density lipoprotein (HDL), HDL subfractions (HDL₂, HDL₃), and low density lipoprotein (LDL) were measured. Training had a significant influence on HDL, HDL₂, LDL/HDL, HDL₂/HDL₃, and chol/ HDL with anaerobic training, these variables changed in the opposite direction compared with aerobic training which influenced the lipoprotein profile in the desired direction. Cholesterol, HDL₃ and LDL did not alter during the nine weeks of training. After nine weeks of training the higher blood lactate concentration during exercise (representing training intensity), the higher resting LDL/HDL ratio was found. The correlation between these two variables was highly significant. They concluded that training above the anaerobic threshold had no negative effects of blood profile. Therefore, beneficial adaptations in lipoprotein

profile. Therefore, beneficial adaptations in lipoprotein profile must be achieved with moderate training intensities below the anaerobic threshold.

Kanstrup and Ekblom (1984) reports on the changes in blood volume (BV) and hemoglobin concentration ([Hb]) were induced in five healthy young men. After acute hypovolemic anemia was achieved by blood withdrawal, VO_2 max values decreased, while the same [Hb] due to acute plasma volume expansion (6% dextran) did not alter VO_2 max. After reinfusion of red blood cells, leading to hypervolemia and increased [Hb], VO_2 max increased. Plasma volume expansion in this situation, leading to hypervolemia at normal [Hb], resulted in slight reduction in VO_2 max, which, however, remained elevated (approximately 4%) above control values. Physical performance, measured as time of exhaustion, corresponded to the changes in VO_2 max except for the hypervolemic anemic situation, where it decreased. Changes in peak heart rate were inversely related to BV changes, but were also influenced by [Hb]. The results point to a significant influence of the total amount of Hb rather than the blood hemoglobin concentration for obtaining a high maximal aerobic power. Thus, a reduced [Hb], concomitantly with an elevated blood volume (plasma volume), may result in an unchanged VO_2 max, but reduced performance time.

Gilliam and Burke (1978) analysed the effect of exercise on serum lipids a six-week study involving 14 females ages 8-10 years. The subjects participated in various aerobic activities for 35 minutes per session. The results showed that a significant increase in HDL-C levels with no change in TC levels. The main flaw in this study was a lack of a control group. Additionally, intensity was described as —strenuous|| but was not quantified, the length of the study was short (six weeks) and the frequencies of the exercise sessions were not reported.

2.3 STUDIES RELATED TO PSYCHOLOGICAL VARIABLES

Virtanen, et.al., (2003) the purpose of study was to determine whether psychological factors are associated with heart rate variability (HRV), blood pressure variability (BPV), and bar reflex sensitivity (BRS) among healthy middle-aged men and women. A population-based sample of 71 men and 79 women (35-64 years of age) was studied. Five-minute supine recordings of ECG and beat-to beat photoplethysmographic finger systolic arterial pressure and diastolic arterial pressure were obtained during paced breathing. Power spectra were computed using a fast Fourier transforms for low frequency (0.01-0.15 Hz) and high-frequency (0.15-0.10 Hz) powers. BRS was calculated by cross-spectral analysis of R-R interval and systolic arterial pressure variability ties. Psychological factors were evaluated by three self-report questionnaires: the Brief Symptom Inventory, and the Toronto Alexithymia Scale. It was found anxiety and hostility is related to reduced BRS and increased low-frequency power of BPV. Reduced BRS reflects decreased parasympathetic outflow to the heart and may increase BPV through an increased sympathetic predominance.

Dr.Swami Shankardevananda (2002) stated that psychological factors such as —prolonged sorrow□ can be the cause of diabetes, this side of the problem is probably the least well understood. Although we know that diabetes is related to lack of insulin, caused either by its non production or reduced production, or by its decreased or mistimed secretion, the original cause may not be in the pancreas at all. We know that emotional and mental disturbance create autonomic nervous system, endocrine gland and metabolic imbalance via the limbic system in the brain and this appears to be major factor in diabetes, especially the maturity onset form. Stress and tension cause increased activity of the sympathetic nervous system and adrenal glands,

which inhibits insulin secretion. Ongoing stress and tension are, therefore, important factors in diabetes.

Griffin , et. al., (2001) conducted a longitudinal study investigating the role of perceived social support in psychological adjustment and disease status in a sample of 42 middle-aged patients with rheumatoid arthritis. Griffin et al. found a stronger correlation between the patient's negative affect and punishing, as opposed to supportive responses to the patient's pain from the primary support provider ($r = 0.32$ versus $r = -0.04$, $p < 0.05$) at Time 1. The authors also found that negative social interaction between the patient and the primary support provider were a significant predictor of patient's negative affect and poorer disease status, as reported by the attending physician at the 9-month follow up.

Hemsley (1992) Rita Elizabeth made a longitudinal study on the academic self – concept in adolescents of ninth and tenth graders. Domain specific self-concept measures were used. The results showed that the achievement groups did not differ in the prediction of self-concept. Regardless of the achievement group, the self-concept caused by the score for the high self-concept subjects was significantly higher than that of the low Self-concept subjects.

Littlefield, et.al. (1990) tested the stress-buffering hypothesis of social support in a sample of 158 adults with type 2 diabetes. As expected, they found no significant association between structural support, as measured by marital status, and depressive symptoms. However, patients who received less adequate social support reported greater severity of depressive symptoms, as measured by the Beck Depression Inventory ($r = -0.31$, $p < 0.001$). In addition, they found evidence for the *stress-buffering* hypothesis, as patients with illness-related impairment, who received more

social support, reported less severe depressive symptoms than patients who felt that their support needs have not been met.

Morries and Rose (1983) examined the effects of practiced schedule of muscle relaxation on the measure of state of anxiety. A given sequence of muscle relaxation exercise was carried out each day for a period of 8 weeks by a group of 10 volunteer male students. Over the same period a matched group followed a daily schedule of 10 minutes rest. During the first and final weeks both groups completed a long version of Spielberger's a state and trait questionnaires and measures were taken for respiration, heart rate and galvanic skin response. Scores of both groups showed almost identical profile with a significant decrease ($P < 0.05$) in the A state scores and a reduction although not significant in the physiological measures. The A state scores taken at the beginning and the end of 8 week practice period showed no change.

Tucker (1983) conducted a study on muscular strength and in relationship with selected psychological traits. He took males as the subjects for this study. The body catthekis scale, Eysenek personality inventory and Tennessee self concept scale were employed to assess personality. Muscular strength was measured by means of free weights in bench press and squat. Because of the effect of body weight on muscular strength body weight was controlled statistically more satisfied with their body parts and processes, less emotionally liable and anxious, more outgoing sociable and impulsive, more confident and satisfied with themselves then their muscular weaker counter parts. All of the psychological traits were associated significantly with performance on the strength measure. The results indicate forty-three percent of the patients showed good response, while six percent of the patients did not show any change. He came to the conclusion that Shavasana is very useful for anxiety states.

Claridge, et. al., (1980) made an attempt to analysis the relationship between psycho-physiological variables connected to human performance and personality variables extroversion and neuroticism there was much evidence indicating that introverts produce superior performance to the extroverts on simple monotonous recognition tasks, the former possessing lower threshold for psychological activity than the extroverts, coupled with a tendency to exhibit higher degree of cardiac and electro dermal activity.

Kirkaldy (1980) conducted the study on the analysis of relationship between psycho physiological variables connected to human performance and the personality variables on extroversion and neuroticisms. In this study he concluded that no significant difference exists along the personality dimension. But when the team sports were classified into offensive, centre and defensive players, it was found that males in attacking position were substantially higher in psychoticism (tough minded, dominant aggressive) and extroversion, compared to mid-field players.

Clanney (1969) conducted a study on a comparison of personality characteristics, self-concepts and academic aptitude of selected college men classified according to performance on test of physical fitness. He divided college men into high fitness and low fitness groups on the basis of AAHPER Youth Fitness Test Battery. While comparing their personality characteristics, as measured by Cattell's 16 P.F> Questionnaire, self concept and academic attitudes, he concluded that high fitness group appeared to be more group dependent while low fitness group was more self sufficient. Also the subjects in high fitness group appeared to be more trusting and free of jealousy whereas, the low fitness group appeared to be more suspicious and self opinionated.

2.4 STUDIES RELATED TO YOGIC TRAINING ON BIO CHEMICAL VARIABLES OF DIABETES MELLITUS PATIENTS

Balaji, P.A., et.al., (2012)., Physiological Effects of Yogic Practices and Transcendental Meditation in Health and Disease. Yoga is an ancient Indian way of life, which includes changes in mental attitude, diet, and the practice of specific techniques such as yoga asanas (postures), breathing practices (pranayamas), and meditation to attain the highest level of consciousness. Since a decade, there has been a surge in the research on yoga, but we do find very few reviews regarding yogic practices and transcendental meditation (TM) in health and disease. Keeping this in view, a Medline search was done to review relevant articles in English literature on evaluation of physiological effects of yogic practices and TM. Data were constructed; issues were reviewed and found that there were considerable health benefits, including improved cognition, respiration, reduced cardiovascular risk, body mass index, blood pressure, and diabetes. Yoga also influenced immunity and ameliorated joint disorders.

Praveenakumar, et. al., (2011) studied the effect of yogic pranayama and meditation on selected physical and physiological variables. Thirty boys in the age group of 12 to 15 years were selected from Karnataka university department of yoga, Dharwad. The subjects were divided into two groups namely control group and Experimental group. The Experimental group was given yogic pranayama and meditation for a period of twelve weeks, both morning and evening on alternative days in a week. The control group did not participate in yogic pranayama and meditation training program. The collected data were statistically analyzed by using analysis of

covariance (ANCOVA). The experiment group had a significant improvement on the selected physical and physiological variables.

Elangovan and Babu (2011) suggested that the effect of yogic practices on selected bio-chemical variables of obese college men with age between 19 to 25 years. The selected subjects were randomly assigned into two equal groups namely experimental group (N: 15) which underwent yogic practices for 12 weeks with 4 sessions per week and control (N:15) which did not undergo any special training. The subjects were tested for Laboratory test prior to and after training on selected variable HDL, and LDL and BMI, the obtained data were statistically assessed for any significant difference using ANCOVA. The author concluded that the significantly increased due to HDL. However LDL cholesterol was significantly decreasing in obese college men.

Vijaya Duraiswamy, et. al., (2011) the practice of yoga, along with physical exercise reduces psychological stress and improves glycemic control in diabetic individuals, thereby preventing its progression to complications. This study evaluated the impact of two combined yogic interventions in the management of Type 2 DM. Around 20 Type 2 diabetic subjects were randomly recruited to participate in the study. This study emphasizes the role of two yogic practices Nadishodhana Pranayama and the Sun Salutation as adjuvant therapy in patients with Type 2 diabetes. A pre-and post- test with yogic intervention for 5 weeks was employed in the study. A student's paired t-test on the overall mean scores and mean scores, stratified by gender, age and duration of diabetes, was conducted to evaluate the hypothesis. 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)

activity were noted. Also, the effect of yogic intervention was found to be more pronounced in subjects with poor glycaemic control.

Dhananjai, et. al., (2010) studied the effect of a yoga practice for 12 weeks on lipid profiles of 56 obese subjects (32 females and 24 males) age ranged from 20 to 45 yrs were evaluated. Results revealed a significant ($p<0.01$) decrease in anthropometric variables (weight, body mass index, waist circumference and hip circumference). Further, total cholesterol, triglyceride, very low density lipoprotein, low density lipoprotein and fasting plasma glucose decreased significantly ($p<0.01$) while high density lipoprotein increase significantly when compare to the basal variables before intervention given ($p<0.01$). A significant and positive correlation was evident among pretreatment anthropometric variables ($p<0.01$) while most of the lipid profiles parameters also showed a significant ($p<0.05$ or $p<0.01$) positive or negative correlation with each other. The pretreatment weight ($r=0.49$; $p<0.01$), waist circumference ($r=0.39$; $p<0.01$) and hip circumference ($r=0.26$; $p<0.05$) showed significant and positive correlation with pretreatment Triglyceride. The change (improvement) in weight and TG were significantly ($r=0.49$, $p<0.01$) associated with each other. However, the improvement in all anthropometric variables and lipid profiles parameters of females and males were found to be similar ($p>0.05$). This pilot study found yoga practices effective in reducing weight. Further, this weight loss is also found to be associated well with the improvements in lipid profiles. Investigations with large sample size, 75 different covariates and follow up of outcomes are needed to validate the effect of other yoga exposures.

Amitha (2009) an objective of this study is to evaluate the effect of Yoga-Nidra on blood glucose level in diabetic patients. This study was conducted on 41,

middle aged, type-II diabetic patients, who were on oral hypo glycaemic alone. These patients were divided into two groups: (a) 20 patients on oral hypoglycaemic with yoga – nidra and (B) 21 were on oral hypoglycaemic alone. Yoga-nidra practiced for 30 minutes daily up to 90 days, parameters were recorded every, 30th day. Results of this study showed that most of the symptoms were subsided ($p < 0.004$, significant), and fall of mean blood glucose level was significant after 3-month of Yoga-nidra. This fall was 21.3mg/dl, $P < 0.007$, (from 159 ± 12.27 to 137.7 ± 23.15 ,) in fasting and 17.95 mg/dl, $P = 0.02$, (from 255.45 ± 16.85 to 237.5 ± 30.54) in post prandial glucose level. Results of this study suggest that subjects on Yoga- nidra with drug regimen had better control in their fluctuating blood glucose and symptoms associated with diabetes, compared to those were on oral hypoglycaemics alone.

Savita Sing, et .al., (2008) a distinguishable feature of type 2 diabetes besides hyperglycemia and deranged lipid profile is an impaired insulin secretion, peripheral insulin resistance and obesity which has become a major health concern worldwide. In this study, we aimed to see if yoga-asanas and pranayamas have any influence in modifying certain biochemical parameters. Sixty patients of uncomplicated type 2 diabetes (age 35-60 yrs of 1-10 yrs duration) were divided into two groups: Group 1 (n=30): performed yoga along with the conventional hypoglycemic medicines and group 2 (n=30): patients who only received conventional medicines. Duration of the study was 45 days. Basal recordings of blood glucose (fasting and post-prandial), lipid profile and serum insulin were taken at the time of recruitment and the second reading after forty five days. Results showed a significant improvement in all the biochemical parameters in group 1 while group 2 showed significant improvement in only few

parameters, thus suggesting a beneficial effect of yoga regimen on these parameters in diabetic patients.

Chen, et. al., (2008) the yoga exercise programme was developed to accommodate the reduced body flexibility experienced by many older adults and was critically reviewed by experts and pilot-tested with community dwelling older adults. This study aimed to test older adults' physical fitness after a 24-week silver yoga exercise programme and to examine whether the programme could be further shortened to fit senior activity centres' programme designs. A quasi-experimental, pre-post tests design was used: baseline, at 12-week and at 24-week periods. Convenience samples of 204 subjects were recruited from eight senior activity centers and 176 subjects completed the study. Subjects were randomly assigned into three groups based on the centers: (1) Experiment I: complete silver yoga with stretching and meditation, (2) Experiment II: shortened silver yoga without the guided-imagery meditation and (3) Waitlist control. The interventions were conducted three times per week for 24 weeks. Physical fitness indicators included body compositions, cardiovascular-respiratory functions, physical functions and the range of motion. At the end of the 24-week period, the physical fitness of subjects in Experiments I and II had significantly improved whether or not guided-imagery meditation was used and all had better physical fitness than subjects in the control group (all $p < 0.05$). The physical fitness of older adults in both the 70-minute complete silver yoga group and the 55-minute shortened silver yoga group had significantly improved after the interventions. It was recommended that the silver yoga programme be shortened by eliminating the guided-imagery meditation. The shortened silver yoga exercise programme is

recommended to be incorporated as an activity programme in community settings to promote the physical fitness of older adults.

Sahay (February 2007) The effect of yogic practices in normal individuals and those with diabetes to assess the role of yogic practices on glycaemic control, insulin kinetics, body composition exercise tolerance and various co-morbidities like hypertension and dyslipidemia. These studies were both short term and long-term. These studies have confirmed the useful role of yoga in the control of diabetes mellitus. Fasting and postprandial blood glucose levels came down significantly. Good glycaemic status can be maintained for long periods of time. There was a lowering of drug requirement and the incidence of acute complications like infection and ketosis was significantly reduced. There were significant changes in the insulin kinetics and those of counter regulatory hormones like cortisol. There was a decrease in free fatty acids. There was an increase in lean body mass and decrease in body fat percentage. The number of insulin receptors was also increased. There was an improvement in insulin sensitivity and decline in insulin resistance. All these suggest that yogic practices have a role even in the prevention of diabetes. There is a beneficial effect on the co-morbid conditions like hypertension and dyslipidemia.

Chaya and Kurpad (2006) investigated the net changes in basal metabolic rate (BMR) of individuals actively engaging in a combination of yoga practices (asana or yogic postures, meditational and pranayama or breathing exercises) for a minimum period of six months, at a residential yoga education and research center at Bangalore, India. They measured BMR of individuals practicing yoga through a combination of practices was compared with that of control subjects who did not practice yoga but led similar life styles. The BMR of the yoga practitioners was significantly lower than

that of the non-yoga group, and was lower by about 13% when adjusted for body weight. This study shows that there is a significantly reduced BMR, probably linked to reduced arousal, with the long term practice of yoga using a combination of stimulatory and inhibitory yogic practices.

Prasad, K.V.V., et. al., (2006) conducted a study on normal 41men and 23 women, to evaluate the impact of Pranayama and Yoga asanas on blood lipid profiles and free fatty acids, in two stages. In stage-I, Pranayama was taught for 30 days and in stage-II, yogic practices were added to Pranayama for another 60 days. A Significant reduction was observed in triglycerides, free fatty acids and LDL cholesterol in men and free fatty acids alone were reduced in women at the end of stage-I. A significant elevation of HDL-cholesterol was seen only in the men at the end of stage-I. At the end of stage-II, free fatty acids increased in both men and women, and women demonstrated a significant fall in serum cholesterol, triglycerides, LDL-and VLDL cholesterol. The results indicated that HDL-cholesterol was elevated in men with Pranayama, while triglycerides and LDL-cholesterol decreased in women after yoga asanas. The results of the study indicate that Pranayama and yoga asanas can be helpful in patients with lipid metabolism disorders such as coronary artery disease, diabetes mellitus and dyslipidemia etc.

Sharma and Malhotra (2005) have done research on diabetic patients. Twenty NIDDM subjects (mild to moderate diabetics) in the age group of 30-60 years were selected from the outpatient clinic of G.T.B. hospital. They were on a 40 days yoga asana training under the supervision of a yoga teacher. 13 specific Yoga asanas done by Type 2 Diabetes Patients included Surya Namaskar, Trikonasana, Tadasana, Sukhasana, Padmasana, Bhastrika Pranayama, Pashimottanasana,

Ardhmatsyendrasana, Pawanmuktasana, Bhujangasana, Vajrasana, Dhanurasana and Shavasana are beneficial for diabetes mellitus. Serum insulin, plasma fasting and one hour postprandial blood glucose levels and anthropometric parameters were measured before and after yoga asanas. A significant decrease in waist-hip ratio and changes in insulin levels were also observed, suggesting a positive effect of yoga asanas on glucose utilization and fat redistribution in NIDDM. Yogasanas may be used as an adjunct with diet and drugs in the management of Type II diabetes.

Manjunatha (2005) has done a research to examine the hypothesis that yogasanas help in the treatment of diabetes mellitus by releasing insulin from the pancreas. Twenty healthy young volunteers (17 male, three female; age 19-31 years) participated in the study. Each volunteer performed four sets of asanas in random order for five consecutive days each with a two days gap between consecutive sets of asanas. The four sets of asanas were: I set= dhanurasana + matsyendrasana, II set= halasana +vajrasana, III set=naukasana + bhujangasana, and IV set=setubandhasana +pavanamuktasana. Blood samples were collected on days four and five of each set of asanas for measurement of glucose and insulin levels before the asanas, within 10 minutes after performing the asanas, and 30 minutes after ingestion of 75 grams. Glucose, which in turn was ingested immediately after the second blood sample. The observations suggest that the performance of asanas led to increased sensitivity of the B cells of pancreas to the glucose signal. The increased sensitivity seems to be a sustained change resulting from a progressive long-term effect of asanas.

Bijlani, et.al., (2005) studied the short-term impact of a brief lifestyle intervention based on yoga on some of the biochemical indicators of risk for cardiovascular disease and diabetes mellitus. The study is based on data collected on

98 subjects (67 male, 31 female) ages 20-74 years, who attended one of the programs. The subjects were a heterogeneous group of patients with hypertension, coronary artery disease, diabetes mellitus, and a variety of other illnesses. The outcome measures were fasting plasma glucose and serum lipoprotein profile. The results shows, fasting plasma glucose, serum total cholesterol, LDL cholesterol, VLDL cholesterol, HDL cholesterol and Triglyceride were significantly lower and HDL cholesterol significantly higher on the last day of the course compared to the first day of the course. The changes were more marked in subjects with hyperglycemia or hypercholesterolemia.

Singh, P.S., (April 2005) the study was conducted on 20 patients of type II Diabetes Mellitus. It provides metabolic and clinical evidence on improvement in glycaemic control and autonomic function. Patient's age ranged from 35 to 55 years and all were of anti hyperglycaemic and dietary regimen. Their baseline fasting and postprandial blood glucose as well as glycosylated Hb were monitored along with autonomic function studies. These patients were given training in Pranayama for 35 minutes / day for 90 days under guidance. Pranayama consisted of Ujjai, Bhastrika, Omkar and Sudarshan kriya. After 3 months of Pranayam the parameters were repeated. The results indicate that there was significant decrease in fasting blood glucose levels from basal 190 ± 18 to 140 ± 16 mg% and postprandial level decreased from 280 ± 20 to 200 ± 18 mg%. Glycosylated Hb showed a decrease from 10 ± 0.30 to 7.80 ± 0.5 after Pranayam. Pulse rate, systolic and diastolic BP decrease significantly after Pranayam. Findings suggest better glycaemic control and stable autonomic function in type II Diabetes Mellitus with regular Pranayama practice.

Singh (2004) and others studied the effect of forty days of yogic exercises on cardiac functions, blood glucose level, glycosylated Hb in type II diabetics. Their baseline fasting and postprandial blood glucose and glycosylated Hb were monitored along with autonomic function studied. The expert gave these patients training in yoga asanas and they pursued those 30-40 min/day for 40 days under guidance. These asanas consisted of 13 well known postures done in a sequence. After 40 days of yoga asanas regimen, the parameters were repeated. The study findings suggest that better glycaemic control and stable autonomic functions (pulse rate, systolic blood pressure and diastolic blood pressure) can be obtained in type II DM cases with yoga asanas and pranayama.

Madanmohan, et. al., (2003) reports on the effect of yoga training on pulmonary functions, very few studies have been undertaken on the endurance. 20 school children in the age group of 12 to 15 years were given yoga training for 6 months. 20 age and gender-matched students formed the control group. The study results shows that yoga training for 6 months improves lung function, strength of respiratory and expiratory muscles as well as skeletal muscle strength and endurance. It is suggested that yoga be introduced at school level in order to improve physiological functions, overall health and performance of students.

Saraswati (2002) Conducted a study on management of diabetics mellitus through six week yoga training (N=15) were selected as subjects of 11 male and 4 females ,age ranged from 30 to 65.The initial test result of fasting blood glucose was between 93-112 mg % with and post lunch glucose was between 116-150 mg %.The yogic practice which administered was Shat Karmas, Asanas, Pranayama. The practices were very effective in controlling blood sugar levels and also in decreasing

the amplitude of risk factors of DM and CDS. The change was more pronounced at the fasting level than the P.P. level. It is predicted that over a period of time a sufferer from diabetes mellitus could completely cure this metabolic disorder, if yogic principles become an integrated part of life.

Tandon, O.P and Malhotra, V., (2002) conducted a study on yoga asanas in assessment of pulmonary function in NIDDM patients. The study done in twenty four NIDDM patients of 30 to 60 year old. Their baseline fasting and postprandial blood glucose and glycosylated Hb were monitored along with pulmonary function. Certain yoga asanas if practiced regularly are known to have beneficial effects on human body. These yoga practices might be interacting with various, somato neuro-endocrine mechanisms to have therapeutic effects. The present study done in twenty four NIDDM patients of 30 to 60 year old, provides metabolic and clinical evidence of improvement in glycaemic control and pulmonary functions. These middle-aged subjects were type II diabetics on anti hyperglycaemic and dietary regimen. Their baseline fasting and postprandial blood glucose and glycosylated Hb were monitored along with pulmonary function studies. The expert gave these patients training in yoga asanas and were pursued 30-40 min/day for 40 days under guidance. These asanas consisted of 13 well known postures, done in a sequence. After 40 days of yoga asanas regimen, the parameters were repeated. The results indicate that there was significant decrease in fasting blood glucose levels .These findings suggest that better glycaemic control and pulmonary functions can be obtained in NIDDM cases with yoga asanas and pranayama. The exact mechanism as to how these postures and controlled breathing interact with somato-neuro-endocrine mechanism affecting metabolic and pulmonary functions remains to be worked out.

Jothipriya (2001) studied the effect of selected yogic asanas, pranayama and meditation on low back pain and physiological variables of female University students. For this purpose twenty students were randomly assigned in to two groups. Group I, Control group, Group II: Experimental group. Control group was not involved in any specific training. Subjects in each group were trained with respective programmes for a period of eight weeks, six days a week, the training session lasted for 1.30 hours, prior to and at the end of training period all subjects were tested, hip flexibility and physiological variables like systolic pressure, diastolic pressure, pulse rate and respiratory rate. The experimental group showed significant improvement on hip flexibility and abdominal strength (Sit and reach and Sit –ups) and range of pain was significantly decreased. Experimental group showed significant improvement on systolic pressure, pulse rate, respiratory rate and but diastolic pressures showed no significant difference in experimental group.

Murugesan, Govindarajan and Bera (2000) conducted a study on the basis of medical officers diagnosis , thirty three (N=33) hypertensive, aged between 35 and 65 years, from the Government general hospital, Pondicherry, were examined with four variables viz. systolic and diastolic blood pressure, pulse rate and body weight. The subjects were randomly assigned into three groups. The experimental group -I underwent selected yoga practices, Experimental group- II received medical treatment by the physician of the said hospital and the control group did not participate in any of the treatment stimuli. Yoga training was imparted in the morning and in the evening with 1hour/session /day for a total period of 11 weeks. Medical treatment comprised drug intake everyday for the whole experimental period. The result revealed that both

the treatment stimuli (i.e., yoga and drug) were effective in controlling the variables of hypertension.

Manchanda, et. al., (2000) evaluated the possible role of lifestyle modification incorporating yoga on retardation of coronary atherosclerotic disease. In this prospective randomized, controlled trial, 42 men with angio-graphically proven coronary artery disease (CAD) were randomized to control (n = 21) and yoga intervention group (n = 21) and were followed for one year. The active group was treated with user-friendly programme consisting of yoga, control of risk factors, diet control and moderate aerobic exercise. The control group was managed by conventional methods i.e. risk factor control and American Heart Step I diet. After one year, the yoga groups showed significant reduction in number of angina episodes per week, improve exercise capacity and decrease in body weight Serum total cholesterol, LDL cholesterol and triglyceride levels also showed greater reductions as compared with control group.

Mahajen, et.al., (1999) conducted a study on the effect of yogic lifestyle on the lipid status was studied in angina patients and normal subjects with risk factors of coronary artery disease. The parameters included the body weight, estimation of serum cholesterol, triglycerides, HDL, LDL, and the cholesterol HDL ratio. A baseline evaluation was done and then the angina patients and risk factors subjects were randomly assigned as control (n=41) and intervention group (n=52). Lifestyle advice was given to both the groups. An integrated course of yoga training was given for four days followed by practice at home. Serial evaluation of both the groups was done at four, 10 and 14 weeks, Dyslipidemia was a constant feature in all cases. An inconsistent pattern of change was observed in the control group of angina (n=18) and

risk factor subjects (n=23). The subjects practicing yoga showed a regular decrease in all lipid parameters except HDL. The effect started from four weeks and lasted for 14 weeks. Thus, the effect of yogic lifestyle on some of the modifiable risk factors could probably explain the preventive and therapeutic beneficial effect observed in coronary artery disease.

Dengel, et. al., (1998) studied effect of Yoga therapy on Obesity and Lipid profile. Twenty five obese individuals were included in this study, majority of them 21, i.e., 84 % were females and 4 i. e., and 16 % were males. The mean age was 41 years. Control group had appreciable improvement in blood lipid levels in the study group. Main fall in serum cholesterol was 26.5 mg (12.43. %) and that in serum triglycerides, it was 22.82 mg % (14.98%). Similarly there was a significant fall in low density lipoproteins (LDL) which was 17.73 % and that in very low density lipoproteins (VLDL) was 12.83 % also a significant fall in fasting blood sugar values was noted in the selected subjects with mean reduction being 38.5 mg i.e.28 %.

Bhargava, Gogate and Mascarenhas (1998) examined the effect of autonomic responses to breath holding and its variations following pranayama. Autonomic responses to breathe holding were studied in twenty healthy young men. Breath was held at different phases of respiration and parameters recorded were Breath Holding time, Heart Rate, Systolic and Diastolic Blood Pressure and Galvanic Skin resistance (GSR). After taking initial recordings all the subjects practiced Nadi-Shodhana Pranayama for a period of 4 weeks. At the end of 14 week the same parameters were again recorded and the results compared. Baseline heart rate and blood pressure (systolic and Diastolic) showed a tendency to decrease and both these autonomic parameters were significantly decreased at breaking point after pranayamic

breathing. Although the GSR was recorded in all subjects the observations made were not conclusive. Thus pranayama breathing exercises appeared to alter autonomic responses to breath holding probably by increasing muscle tone and decreasing sympathetic discharges.

Telles,et. al., (1997) conducted a group of healthy who were performing yoga and age matched controls were compared in this study. The examination included biochemical, hematological and ventilator function tests. At the end of six months both groups showed a significant decrease in blood sugar with increase in plasma protein specially albumin, slowing of pulse rate, corrective improvement in hematological values were noted in this study, Mid expiratory flow rate was found to have appreciable improvement in majority of the patients.

Shankardayalan (1996) suggested that a study on effect of yogic exercise on muscular performance and body composition in adult male. He selected fifty male students and divided into two groups of equal number of twenty five subjects each. One group was utilized as control group and the other group as experimental. The experimental period was eight weeks. The data on aerobic capacity, sit-ups, flexibility and percentage body fat were obtained before pre test and after post test the experimental period. The obtained F' ratio was tested for significance at 05 level of confidence. The found out measure all the variables such as 94 aerobic capacity, muscular endurance, flexibility and percent body fat in favour of experimental group. He concluded that the aerobic capacity was increased, and the muscular endurance was improved. Flexibility was developed. The significant difference was found in percent body fat of yogasana practice programme.

Eriksson (1993) Exercise has long been considered a cornerstone in the treatment regimen for patients with Type II (non-insulin dependent) diabetes mellitus. Aerobic endurance exercise has traditionally been advocated as the most suitable exercise mode. Several exercise studies have evaluated the effect of exercise on insulin sensitivity and glycaemic control in patients with type II diabetes mellitus. However, the results obtained have been highly heterogeneous regarding the effect of exercise on insulin sensitivity and glycaemic control. Only in certain subgroups (example patients with Type II diabetes mellitus under 55 years of age, those with diabetes treated through diet and those who have diabetes with fairly good metabolic control), does exercise seem to be beneficial with regard to improvement in glycaemic control. There has been little research into the effects of resistance training on glucose metabolism in patients with type II diabetes mellitus compared with the amount of research involving aerobic endurance exercise. The incidence of Type II diabetes mellitus increases with increasing age, partly because of the decline in muscle mass associated with aging. This corresponds with a decline in metabolic function, supporting the usefulness of resistance training. Available studies support the usefulness of resistance training in the treatment of Type II diabetes mellitus. Therefore, based on the published studies reviewed, this author proposes that an optimal exercise programme for individuals with Type II diabetes mellitus should include components that improve cardio respiratory fitness, muscular strength and endurance, a combination of aerobic endurance training and circuit-type resistance training. Programmes combining various modes of exercise positively influence patient compliance with the exercise programme. The vast majority of patients with

type II diabetes mellitus can undertake an individualized exercise programme without significantly increased risks of complications.

Robin Monroe, et.al., (1992) conducted a study, the potential of yoga therapy as an aid to the management of non-insulin –dependent diabetes mellitus. The study were conducted on 21 patients with NIDDM, 13 were take medication, the remainder were on diet alone. The yoga group was offered five yoga classes per week for twelve weeks. Fasting blood glucose and glycated haemoglobin (HbA1C) were analysed before and after 12 weeks of yoga. They concluded that both FPG and HbA1C improved significantly in the yoga group, compared to the controls.

Chinnasamy (1992) conducted a study on effects of asanas and physical exercise on selected physiological and biochemical variables among school boys. In his study ninety males students were randomly selected from Government Higher Secondary School. The initial score were measured for the selected physiological and biochemical variables namely pulse rate, systolic blood pressure, diastolic blood pressure hemoglobin content and blood sugar level. The treatment was given for a period of 6 weeks for the experimental group. The significance of the difference among two minds of exercise group and asanas group for the pre and post test mean gain were determined by F ratio through analysis of variance. Asanas had significantly improved the hemoglobin content, blood sugar, pulse rate and blood pressure.

Sahay, B.K. et al, (1991) studied the effect of yogic practices on the exercise tolerance in diabetes . After three months well designed exercise program, the benefits include a reduction in body weight, normalization of glucose tolerance, an increase in maximal oxygen uptake, reduction in blood pressure, and preservation of the early responsiveness to glucose loading were concluded.

Yeater, et.al., (1990) made a research on coronary risk factors in Type 2 diabetes: response to low-intensity aerobic exercise. Patients with non-insulin dependent diabetes are at greatly increased risk for coronary artery disease. Although exercise training has been shown to decrease risk factors, the presence of obesity, old age, and a sedentary lifestyle makes a high-intensity exercise program an unrealistic choice of therapy. Therefore, we examined the effect of a low-to moderate- intensity (mean 69 per cent of maximal heart rate) walking program on lipids, glucose, insulin, glycosylated hemoglobin and cardiovascular fitness. Nine women and seven men, mean age 56, were randomly assigned to a control or an exercise group which exercised three times per week for two months. Supervised exercise sessions consisted of 40-45 minutes of walking and /or slow jogging. Subjects continued on their usual diets. The trained group showed a significant improvement in VO₂max from 1.65 to 1.95 L / min. resting systolic blood pressure decreased from 141 to 130 mm Hg after training, and resting heart rate decreased from 88 to 81. Glycosylated hemoglobin decreased in the exercise group in seven or eight subjects and in only two of eight controls. Triglycerides decreased in the exercise group from 285 to 223 mg /dl. Body weight, total and HDL cholesterol, glucose, and insulin did not change in either group. These data indicate that a low to-moderate level of aerobic training, independent of dietary changes, is an effective and feasible method of improving cardiovascular risk factors considering physical fitness, systolic blood pressure, and glycemic control in noninsulin-dependent diabetic subjects.

Gore(1987-88) investigated the beneficial effect of yoga training was observed on six out of nine diabetics in respect of fasting and postprandial blood sugar level, sugar in urine, glucose tolerance and medication. Avoidance of exertion and

emphasis on relaxation and tranquilization were the main objectives of yoga training and practice. Doing the postures in a relaxed manner, without exertion, yogic meditation and breathing help most patients to control the causes of diabetes.

Nayaer, M.S, et. al., (1986) investigated the effects of yogic exercises on human physical efficiency. The studies were conducted on 53 cadets of national defense academy. The parameters of assessment included ventilation, minute volume of respiration, oxygen consumption, pulse rate and blood pressure, mechanical efficiency and maximum oxygen uptake. Four additional assessments were made under resting condition viz, vital capacity (VC), maximum, breathing capacity (MBC) forced expiratory volume (FFVB 10 sec) and breath holding time. All the three groups showed significant decrease in pulse rate during exercises. The yogic group in addition recorded a highly significant increase in breath holding time. The remaining two groups recorded only significant increase in VC, ventilation, minute volume, rate of respiration, blood pressure mechanical efficiency, maximum oxygen uptake capacity and MBC remained unaltered in all the three groups.

Packiam Amulraj (1984) an elaborate study revealed that three months of yogic training has reduced the blood sugar level of diabetic patients with a mean difference of 79.74 and is found significant. It has also helped to reduce the blood pressure in diabetic patients significantly. In the same patient, from the mean of 219.48 to 188.61 body weight of the diabetic patient has reduced after yogic exercises even though it was not significant. It is seen from the study that the experimental group has reduced more blood sugar, blood pressure level and cholesterol than the control group.

2.5 STUDIES RELATED TO YOGIC TRAINING ON PSYCHOLOGICAL VARIABLES OF DIABETES MELLITUS PATIENTS

Prince Deva Fredrick,D., (2011) the purpose of this study was to find out the effect of different packages of yogasanas on selected motor fitness, Physiological and psychological variables among 90 juvenile delinquents, confined in different Rehabilitation Homes in Chennai, were randomly selected in the age group of boys between 14 and 17 years. They were randomly divided into three groups, namely, Iyengar Yoga group and Christina yoga group and control group consisting of 30 juveniles in each. Motor fitness variables - flexibility, muscular endurance, agility, physiological variables – vital capacity, vo2 max, cardio respiratory endurance, psychological variables – anxiety, aggression and self confidence were selected for this study. The experimental groups participated in their respective yogic practices package I and package II for a period of twelve weeks. The Pre tests and post tests were conducted on the above said dependent variables from all the three groups. The results of this study proved that different packages of yogasanas significantly improved selected motor fitness variables, flexibility, muscular endurance, and agility; physiological variables, vital capacity, VO2 max and cardio respiratory endurance; reduced psychological variables anxiety and aggression and improved self confidence of the juvenile delinquents.

Robson (2011) examine the efficaciousness of yoga and exercise in acutely improving mood in non-depressed participants. This study involved female participants of a yoga group (n=8) and an exercise group (n=7). Participants completed a Profile of Mood States (POMS) questionnaire before undertaking a sixty minute class. An identical POMS questionnaire was then completed immediately after

the class had ended. Both yoga and exercise improved these mood states. Exercise and yoga significantly increase vigor, and reduce depression, tension, confusion, anxiety and anger. Both are invigorating to participants and provide an uplifting effect and increase in feelings of positivity; they would be a viable method of self-treatment for people experiencing low mood. With further research, exercise and yoga would be a viable option of an alternative or adjunct to medication.

Kosuri, M., and Sridhar, G.R., (2009) conducted a study of Yoga Practice on Physical and Psychological Outcomes. The aim of this study was to examine the effect of Yoga practice on clinical and psychological outcomes in subjects with type 2 diabetes mellitus (T2DM). In a 40-day yoga camp at the Institute of Yoga and Consciousness, ambulatory subjects with T2DM not having significant complications (n=35) participated in a 40-day yoga camp, where yogic practices were overseen by trained yoga teachers. Clinical, biochemical and psychological well-being were studied at baseline and at the end of the camp. At the end of the study, there was a reduction of body mass index (BMI) (26.514 +/- 3.355 to 25.771 +/- 3.40; P < 0.001) and anxiety (6.20 +/- 3.72 to 4.29 +/- 4.46; P < 0.05) and an improvement in total general well-being (48.6 +/- 11.13 to 52.66 +/- 12.87; P < 0.05). Participation of subjects with T2DM in yoga practice for 40 days resulted in reduced BMI, improved wellbeing, and reduced anxiety.

Hafner-Holter, Kopp and Gunter (2009) conducted a study on Effects of fitness training and yoga on well-being, social competence and body image. It describes and compares influences from physical activity program and a yoga program on well-being, mood, stress coping, body-image and social competence in healthy people. 18 persons attending a gym and 21 taking part in a yoga program answered

following questionnaires before entering the program and taking part for 20 units: Body-Image-Questionnaire (25), Symptom – Checklist – 90 R (8), Complaint-List (31), Adjective Mood-Scale (32) and a Visual Analogue Scale for assessing stress-level (10). Statistical analyses show significant improvement in social competence in both training groups; the gym-group show a reduction in summarization and body-related anxiety as well as an improvement in physical and emotional well-being. Our findings support the evidence that physical activity in general improves psychological wellbeing, however, gym and yoga seems to have different psychological impacts. Future research should focus on comparing the psychological effects of different physical activity interventions in prevention programmes as well as exercise prescriptions in patients with mental illness.

Brown, R.P., and Gerbang, P.L., (2009) stated that Yoga breathing is an important part of health and spiritual practices in Indo-Tibetan traditions. Considered fundamental for the development of physical well-being, meditation, awareness, and enlightenment, it is both a form of meditation in itself and a preparation for deep meditation. Yoga breathing (pranayama) can rapidly bring the mind to the present moment and reduce stress. In this paper, they review data indicating how breath work can affect longevity mechanisms in some ways that overlap with meditation and in other ways that are different form, but that synergistically enhance, the effects of meditation. They also provide clinical evidence for the use of yoga breathing in the treatment of depression, anxiety, post-traumatic stress disorder, and for victims of mass disasters. By inducing stress resilience, breath work enabled them to rapidly and compassionately relieve many forms of suffering.

Javnbakht M, Hejazi Kenari .R., and Hisami. M., (2009) stated that Yoga has often been perceived as a method of stress management tool that can assist in alleviating depression and anxiety disorders. This study sought to evaluate the influence of yoga in relieving symptoms of depression and anxiety in women who were referred to a yoga clinic. The study involved a convenience sample of women who were referred to a yoga clinic from July 2006 to July 2007. All new cases were evaluated on admission using a personal information questionnaire as well as Beck and Spielberger tests. Participants were randomly assigned into an experimental and also a control group. The experimental group (n=34) participated in twice weekly yoga class of 90 minutes duration for two months. The control group (n=31) was assigned to a waiting list and did not receive yoga. Both groups were evaluated again after the two-month study period. The average prevalence of depression in the experimental group pre and post Yoga intervention was 12.82+/-7.9 and 10.79+/-6.04 respectively, a statistically insignificant decrease (p=0.13). However, when the experimental group was compared to the control group, women who participated in yoga classes showed a significant decrease in state anxiety (p=0.03) and trait anxiety (p<0.001). Participation in a two-month yoga class can lead to significant reduction in perceived levels of anxiety in women who suffer from anxiety disorders. This study suggests that yoga can be considered as a complementary therapy or an alternative method for medical therapy in the treatment of anxiety disorders.

Rashmi Vyas (2008), this study was designed to assess the effect of raja yoga meditation of Brahmakumaris which is very simple to practice, on 79 serum lipids in normal Indian women. 49 normal female volunteers were the subjects. They were divided into pre–menopausal (n = 23) and post –menopausal (n=26) groups. They

were further divided into non- mediators (who had never done any kind of meditation), short – term mediators (meditation for more than 5 years). Lipid profile was assessed using their respective reagent sets. Serum cholesterol, triglyceride and low-density lipoprotein – cholesterol in non – mediators were significantly more in post – menopausal women as compared to pre- menopausal women. Serum cholesterol and low density lipoprotein cholesterol were significantly lowered in both short and long term mediators as compared to non – mediators in post – menopausal women. No significant difference was observed in lipid profile in pre - menopausal women. Raja yoga meditation lowered serum cholesterol and low – density lipoprotein – cholesterol in post – menopausal women thus reducing the risk of coronary artery disease in them.

Sharma, R., Gupta, N., Bijlani ,R.L., (2008)Yoga is assuming importance in improving mental health and quality of life in the treatment of a number of psychiatric and psychosomatic disorders. The present study was a prospective controlled study to explore the short-term impact of a comprehensive but brief lifestyle intervention, based on yoga, on subjective well being levels in normal and diseased subjects. Normal healthy individuals and subjects having hypertension, coronary artery disease, diabetes mellitus or a variety of other illnesses were included in the study. The outcome measures were 'subjective well being inventory' (SUBI) scores, taken on the first and last day of the course. The inventory consists of questions related to one's feelings and attitude about various areas of life, such as happiness, achievement and interpersonal relationship. There was significant improvement in the subjective well being scores of the 77 subjects within a period of 10 days as compared to controls. These observations suggest that a short lifestyle modification and stress management educational program leads to remarkable improvement in the subjective well being

scores of the subjects and can therefore make an appreciable contribution to primary prevention as well as management of lifestyle diseases.

Smith, et. al., (June 2007) this study was determined to compare yoga and relaxation as treatment modalities at 10 and 16 weeks from study baseline to determine if either of modality reduces subject stress, anxiety, blood pressure and improve quality of life. A randomized comparative trial was undertaken comparing yoga with relaxation. One hundred and thirty-one subjects with mild to moderate levels of stress were recruited from the community in South Australia. Finally it was observed that Yoga provides a comparable improvement in stress, anxiety and health status compared to relaxation.

Carlson, et. al., (2006) The purpose of the present pilot study was to examine the physical and psychological benefits afforded by a 7-week yoga program for cancer survivors. Eligible participants (per-screened with PAR-Q/PAR-MED-X) were randomly assigned to either the intervention (n=20) or control group (n=18). All participants completed pre- and post-testing assessments immediately before and after the yoga program, respectively. The yoga program participants included primarily breast cancer survivors, on average 55.95 (54.39) months post-diagnosis. Significant differences between the intervention and the control group at post-intervention were seen only in psychosocial (i.e. global quality of life, emotional function, and diarrhea) variables. There were also trends for group differences, in the hypothesized directions, for the psychosocial variables of emotional irritability, gastrointestinal symptoms, cognitive disorganization, mood disturbance, tension, depression, and confusion. These initial findings suggest that yoga has significant potential and should be further explored as a beneficial physical activity option for cancer survivors. Future research

might attempt to include a broader range of participants (e.g. other types of cancer diagnoses, male subjects), a larger sample size, and a longer program duration in an RCT.

Oken, et. al., (2006) there are potential benefits of mind body techniques on cognitive function because the techniques involve an active attention or mindfulness component, but this has not been fully explored. **OBJECTIVE:** To determine the effect of yoga on cognitive function, fatigue, mood, and quality of life in seniors. Randomized, controlled trial comparing yoga, exercise, and wait-list control groups. One hundred thirty-five generally healthy men and women aged 65-85 years. Participants were randomized to 6 months of Hatha yoga class, walking exercise class, or wait-list control. Subjects assigned to classes also were asked to practice at home. Outcome assessments performed at baseline and after the 6-month period included a battery of cognitive measures focused on attention and alertness, the primary outcome measures being performance on the Stoop Test and a quantitative electroencephalogram (EEG) measure of alertness; SF-36 health-related quality of life; Profile of Mood States; Multi-Dimensional Fatigue Inventory; and physical measures related to the interventions. One hundred thirty-five subjects were recruited and randomized. Seventeen subjects did not finish the 6-month intervention. There were no effects from either of the active interventions on any of the cognitive and alertness outcome measures. The yoga intervention produced improvements in physical measures as well as a number of quality-of-life measures related to sense of well-being and energy and fatigue compared to controls. There were no relative improvements of cognitive function among healthy seniors in the yoga or exercise group compared to the wait-list control group. Those in the yoga group showed significant improvement

in quality-of-life and physical measures compared to exercise and wait-list control groups.

Brown and Gerbarg (2005) found Yogic breathing a unique method for balancing the autonomic nervous system and influencing psychological and stress-related disorders. Part I of this series presented a neurophysiologic theory of the effects of Sudarshan Kriya Yoga (SKY). Part II reviewed clinical studies, their own clinical observation, and guidelines for the safe and effective use of yoga breathing techniques in a wide range of clinical conditions. The authors avow that although more clinical studies are needed to document the benefits of programs that combine pranayama (yogic breathing) asanas (yoga postures), and meditation, there is sufficient evidence to consider Sudarshan Kriya Yoga to be a beneficial, low risk, low-cost adjunct to the treatment of stress, anxiety, post-traumatic stress disorder (PTSD), depression, stress-related medical illnesses, substance abuse, and rehabilitation of criminal offenders. SKY has been used as a public health intervention to alleviate PTSD in survivors of mass disasters. Yoga techniques enhance well-being, mood, attention, mental focus, and stress tolerance. Proper training by a skilled teacher and a 30-minute practice every day will maximize the benefits. Health care providers play a crucial role in encouraging patients to maintain their yoga practices.

Yadav, R.K , (2005) There are indications that psychological stress increases oxidative stress whereas relaxation decreases it. The test was conducted on concentration of thibarbituric acid reactive substances (TBARS) in blood as an indicator of oxidative stress at the beginning and at the end of a comprehensive yoga – based life style modification program (YLMP).The data was collected from 104 subjects (59male,45 female).The YLMP consisted of a nine day educational outpatient

course on the theory and practice of yoga and included , besides a daily one hour practice of physical postures (asanas) and breathing exercises (pranayama) lecture and films on yoga ,stress management and nutrition, practice of meditation and shavasana and individual counseling. Venous blood samples were collected on the first and last day of the course. The study suggests that a brief low cost lifestyle intervention based on yoga reduces oxidative stress.

Parshad (June 2004) this study was investigated to prove the state of the mind and that of the body are intimately related. If the mind is relaxed, the muscles in the body will also be relaxed. Stress produces a state of physical and mental tension. Yoga, developed thousands of years ago, is recognized as a form of mind-body medicine. In yoga, physical postures and breathing exercises improve muscle strength, flexibility, blood circulation and oxygen uptake as well as hormone functions. In addition, the relaxation induced by meditation helps to stabilize the autonomic nervous system with a tendency towards parasympathetic dominance. Physiological benefits which follow help yoga practitioners become more resilient to stressful conditions and reduce a variety of important risk factors for various diseases, especially cardio-respiratory diseases.

Harinath, et. al., (2004) Conducted a study to find out the effects of Hatha yoga and Omkar meditation on cardio-respiratory performance, psychological profile and meditation secretion. Thirty healthy men in the age group between 25 and 35 years volunteered involved in this study. They were randomly divided in two groups of 15 each. Group I subjects served as control and performed body flexibility exercises for 40 minutes and slow running for 20 minutes during morning hours daily for 3 months. Group II subjects practices selected yogic asanas for 45 minutes and

pranayama for 15 minutes during the morning .Whereas during the evening hours these subjects performed preparatory yogic postures for 15 minutes, pranayama for 15 minutes and meditation for 30 minutes daily, for three months. The psychological profiles were measured before and after three months of yogic practices. Serial blood samples were drawn at various time intervals to study effects of these yogic practices and omkar meditation levels. Yogic practices resulted in an improvement in cardio respiratory performance and psychological profile.

Damodaran, et.al., (2002), studied the effect of yoga on the physiological, psychological well being, psychomotor parameter and modifying cardiovascular risk factors in mild to moderate hypertensive patients. Twenty patients (16 males, 4 females) in the age group of 35 to 55 years with mild to moderate essential hypertension underwent yogic practices daily for one hour for three months. Biochemical, physiological and psychological parameters were studied prior and following a period of three months of yoga practices, biochemical parameters included, blood glucose, lipid profile, catecholamine, MDA, Cholinesterase and urinary VMA. Psychological evaluation was done by using personal orientation inventory and subjective well being. Results showed decrease in blood pressure and drug score modifying risk factors i.e. blood glucose, cholesterol and triglycerides decreased the overall improvement in subjective well being and quality of life. There were decrease in VMA Catecholamine, and decrease at the MDA level suggestive of decrease in sympathetic activity and oxidant stress.

Asnani (2001) undertook a study to observe the beneficial effects of yogic practices during training period on the young trainees. 54 trainees of 20-25 years age group were divided randomly in two groups i.e. yoga and control group. Yoga group

(23 males and 5 females) was administered yogic practices for the five months of the course while control group (21 males and 5 females) did not perform yogic exercises during this period. From the 6th to 10th months of training both the groups performed the yogic practices. Physiological parameters like heart rate, blood pressure, oral temperature, skin temperature in resting condition: responses to maximal and sub maximal exercise, body flexibility were recorded. Psychological parameters like personality, learning arithmetic and psychomotor ability and mental well being were also recorded. Various parameters were taken before and during the 5th and 10th month of training period. Initially there was relatively higher sympathetic activity in both the groups due to the new work/training environment but gradually it subsided. Later on at the 5th and 10th month, yoga group had relatively lower sympathetic activity than the control group. There was improvement in performance at sub maximal level of exercise and in anaerobic threshold in the yoga group. There was improvement on various psychological parameters like reduction in anxiety and depression and a better mental function after yogic practices.

Gimbel (December 1998) this study is Hatha yoga and meditation as adjunctive therapies for promoting and maintaining wellness offer an excellent example of the mind-body connection at work. Hatha yoga creates balance, physically and emotionally, by using postures, or asanas, combined with breathing techniques. Meditation and guided imagery not only support the physical and emotional work being done by the postures and breathing, they open the door to self-actualization to create the perfect union of the mind, body, and spirit. This report discusses the definitions of hatha yoga, meditation, and imagery and their clinical applications.

Schell, F.J., et.al., (1994) stated that, heart rate, blood pressure, the hormones cortisol, prolactin and growth hormone and certain psychological parameters in a yoga practicing group and a control group of young female volunteers residing in a comfortable position during the experimental period. There were no substantial differences between the groups concerning endocrine parameters and blood pressure. The course of heart rate was significantly different; the yoga group had a decrease during the yoga practice. Significant differences between both groups were found in psychological parameters. In the personality inventory the yoga showed markedly higher scores in life satisfaction and lower scores in excitability, aggressiveness, openness, emotionally and somatic complaints. Significant differences could also be observed concerning coping with stress and the mood at the end of the experiment. The yoga group had significant higher scores in high spirits.

Samprasad, et. al., (1991) undertook the study of evaluation of the yoga on anxiety in youth in relation to anxiety inducing areas of life. A total number of 356 subjects comprising 243 males and 113 females with an average age of 18-19 years. A comprehensive training programme in yoga and meditation for two hours everyday for one month. Sinha's Anxiety scale was administered before and post training. Differences in the pre and post training scores on anxiety were calculated and analysed for finding out the effectiveness of training programmes. The results indicated that anxiety got significant, (0.01) reduced impact of anxiety inducing situation in type got (0.01) reduced.

Kocher (1972) Conducted a study on yoga practices as a variable in neurotism, anxiety and hostility. 37 subjects (20 in the experimental group and 17 in the control group) were administered the N.S.Q., A.S.W. and H.D.H.Q. tests. The experimental

group was given yoga training for a period of 9 months. Tests were given twice to observe the changes as a result of yogic practices. Results on the whole showed that there was significant reduction in total neurotism, anxiety, and general hostility scores and the individual can achieve more emotional balance when compared to the control group.

2.6 SUMMARY OF THE LITERATURE

The reviews are presented under five sections such as Studies related to Diabetes mellitus ,Studies related to Bio-Chemical variables, Studies related to Psychological variables ,Studies related to yogic training on Bio chemical variables of diabetes mellitus patients and Studies related to yogic training on psychological variables of diabetes mellitus patients . All the research studies presented in this section proved that integrated modules of yogic practices contribute significantly for better improvement in health related, lipid profile variables and better preventive process of diabetic diseases. The review of literature helped the researcher from the methodological point of view too. It was learnt that most of the research studies cited in this chapter on analysis and experimental design as the appropriate methods for find out the training. The research studies reviewed are from books, journals and available web sites such as www.pubmed.com, www.diabetology.com, etc,