Chapter-II

REVIEW OF RELATED LITERURE

The related literature reviewed for better understanding of the problem investigated and to interpret the results is presented in this chapter. The reviews are classified under the following headings:

1. Studies related to Physiological variables.
2. Studies related to Biochemical variables.
3. Studies related to Psychological variables.
4. Studies related to yogic therapy on selected variables.
5. Studies related to alternative therapy on selected variables.
6. Summary of the literature.

2.1 Studies Related to Physiological Variables

Hegde, et al., (2011), assessed the effect of yoga on anthropometry, blood pressure, glycemic control, and oxidative stress in type 2 diabetic patients on standard care in comparison with standard care alone. The study involved 123 patients stratified according to groups with microvascular complications, macrovascular complications, and peripheral neuropathy and without complications and assigned to receive either standard care or standard care along with additional yoga for 3 months In comparison with standard care alone, yoga resulted in significant reduction in BMI, glycemic control, and malondialdehyde and increase in glutathione and vitamin C. There were no differences in waist circumference, waist-to-hip ratio, blood pressure, vitamin E, or superoxide

dismutase in the yoga group at follow-up. Yoga can be used as an effective therapy in reducing oxidative stress in type 2 diabetes. Yoga in addition to standard care helps reduce BMI and improve glycemic control in type 2 diabetic patients.

Rajakumar, (2010), quoted the purpose of the study is to analyze the impact of yogic practices and physical exercises on selected physiological variables among the intercollegiate soccer players. To achieve this purpose, sixty (60) male intercollegiate soccer players from the various colleges; Chennai were selected at random. Their age ranged between 17 to 22 years. The selected subjects were divided into three equal groups of 20 each, namely yogic practice group (Group A), physical exercises group (Group B) and control group (Group C). The experimental groups have underwent 12 weeks of training namely; yogic practices and physical exercises respectively, whereas the control group (Group C) maintained their daily routine activities and no special training was given. The subjects of the three groups were tested using standardized tests and procedures on selected physiological variables before and after the training period to find out the training efforts in the following test items: Resting pulse rate through stethoscope, Breath holding time through digital stop watch, Peak flow rate through Wright's peak flow meter. The collected data were analyzed statistically through Analysis of Co-variance (ANCOVA) and Scheff's post hoc test to find out the pre and post training performances, compare the significant difference between the adjusted final means and the better group. The yogic practice group showed significant improvement due to 12 weeks training on resting pulse rate, breath holding time and peak flow rate compared to the physical exercise and control group. In the overall training effects in terms of improved number of Physiological variables and their magnitude of improvement

through training, yogic practice group is found to be the better group when compared to the other two groups.

Ramos, et al., (2009), done a research on "Cardiovascular and Metabolic Effects of Intensive Hatha Yoga Training in Middle-Aged and Older Women from Northern Mexico". The study contains the following. Background: Hatha Yoga (HY) can be an alternative to improve physical activity in middle-aged and older women. However, conventional HY (CHY) exercising may not result in enough training stimulus to improve cardiovascular fitness. The purpose of this study was to evaluate the effect of an intensive HY intervention (IHY) on cardiovascular risk factors in middle-aged and older women from Northern Mexico. Materials and Methods: In this prospective quasi experimental design, four middle-aged and nine older CHY practicing females (yoginis) were enrolled into an 11-week IHY program consisting of 5 sessions/week for 90 min (55 sessions). The program adherence, asana performance, and work intensity were assessed along the intervention. Anthropometric [body mass index (BMI), % body fat and Σ skin folds], cardiovascular fitness [maximal expired air volume (VE(max)), maximal O(2) consumption (VO(2max)), maximal heart rate (HR(max)), systolic (BPs) and diastolic blood pressure (BPD)], biochemical [glucose, triacylglycerol's (TAG), total cholesterol (TC), high-density lipoprotein cholesterol (HDL-C), and low-density lipoprotein cholesterol (LDL-C)], and dietary parameters were evaluated before and after IHY. Results: Daily caloric intake (~1,916 kcal/day), program adherence (~85%), and exercising skills (asana performance) were similar in both middle-aged and older women. The IHY program did not modify any anthropometric measurements. However, it increased VO (2max) and VE (max) and HDL-C while TAG and LDL-C remained stable

in both middle-aged and older groups ($P < 0.01$). The proposed IHY program improves different cardiovascular risk factors (namely VO (2max) and HDL-C) in middle-aged and older women.

Pramanik, et al., (2009), evaluated the immediate effect of slow pace bhastrika pranayama (respiratory rate 6/min) for 5 minutes on heart rate and blood pressure and the effect of the same breathing exercise for the same duration of time (5 minutes) following oral intake of hyoscine-N-butylbromide (Buscopan), a parasympathetic blocker drug. Heart rate and blood pressure of volunteers (n = 39, age = 25-40 years) was recorded following standard procedure. First, subjects had to sit comfortably in an easy and steady posture (sukhasana) on a fairly soft seat placed on the floor keeping head, neck, and trunk erect, eyes closed, and the other muscles reasonably loose. The subject is directed to inhale through both nostrils slowly up to the maximum for about 4 seconds and then exhale slowly up to the maximum through both nostrils for about 6 seconds. The breathing must not be abdominal. These steps complete one cycle of slow pace bhastrika pranayama (respiratory rate 6/min). During the practice the subject is asked not to think much about the inhalation and exhalation time, but rather was requested to imagine the open blue sky. The pranayama was conducted in a cool, well-ventilated room (18-20 degrees C). After 5 minutes of this breathing practice, the blood pressure and heart rate again were recorded in the aforesaid manner using the same instrument. The other group (n = 10) took part in another study where their blood pressure and heart rate were recorded following half an hour of oral intake of hyoscine-N-butylbromide 20 mg. Then they practiced the breathing exercise as stated above, and the abovementioned parameters were recorded again to study the effect of

parasympathetic blockade on the same pranayama.It was noted that after slow bhastrika pranayamic breathing (respiratory rate 6/min) for 5 minutes, both the systolic and diastolic blood pressure decreased significantly with a slight fall in heart rate. No significant alteration in both blood pressure and heart rate was observed in volunteers who performed the same breathing exercise for the same duration following oral intake of hyoscine-N-butylbromide. Vagal cardiac and pulmonary mechanisms are linked, and improvement in one vagal limb might spill over into the other. Baroreceptor sensitivity can be enhanced significantly by slow breathing (supported by a small reduction in the heart rate observed during slow breathing and by reduction in both systolic and diastolic pressure). Slow pace bhastrika pranayama (respiratory rate 6/min) exercise thus shows a strong tendency to improving the autonomic nervous system through enhanced activation of the parasympathetic system.

Yang, et al, (2009), Various modes of physical activity, combined with dieting, have been widely recommended to prevent or delay type 2 diabetes. Among these, yoga holds promise for reducing risk factors for type 2 diabetes by promoting weight loss, improving glucose levels and reducing blood pressure and lipid levels. This pilot study aimed to assess the feasibility of implementing a 12-week yoga program among adults at high risk for type 2 diabetes. Twenty-three adults (19 Whites and 4 non-Whites) were randomly assigned to the yoga intervention group or the educational group. The yoga group participated in a 3- month yoga intervention with sessions twice per week and the educational group received general health educational materials every 2 weeks. All participants completed questionnaires and had blood tests at baseline and at the end of 3 months. Effect sizes were reported to summarize the efficacy of the

intervention. All participants assigned to the yoga intervention completed the yoga program without complication and expressed high satisfaction with the program (99.2%). Their yoga session attendance ranged from 58.3 to 100%. Compared with the education group, the yoga group experienced improvements in weight, blood pressure, insulin, triglycerides and exercise self-efficacy indicated by small to large effect sizes. This preliminary study indicates that a yoga program would be a possible risk reduction option for adults at high risk for type 2 diabetes. In addition, yoga holds promise as an approach to reducing cardiometabolic risk factors and increasing exercise self-efficacy for this group.

Skoro, et al., (2009), explored the feasibility of researching community based yoga classes in Type 2 diabetes with a view to informing the design of a definitive, multi-centre trial The study design was an exploratory randomised controlled trial with indepth process evaluation. The setting was two multi-ethnic boroughs in London, UK; one with average and one with low mean socio-economic deprivation score. Classes were held at a sports centre or GP surgery. Participants were 59 people with Type 2 diabetes not taking insulin, recruited from general practice lists or opportunistically by general practice staff. The intervention group were offered 12 weeks of a twice-weekly 90-minute yoga class; the control group was a waiting list for the yoga classes. Both groups received advice and leaflets on healthy lifestyle and were encouraged to exercise. Primary outcome measure was HbA1c. Secondary outcome measures included attendance, weight, waist circumference, lipid levels, blood pressure, UKPDS cardiovascular risk score, diabetes related quality of life (ADDQoL), and self-efficacy. Process measures were attendance at yoga sessions, self-reported frequency of practice

between taught sessions, and qualitative data (interviews with patients and therapists, ethnographic observation of the yoga classes, and analysis of documents including minutes of meetings, correspondence, and exercise plans). Despite broad inclusion criteria, around two-thirds of the patients on GP diabetic registers proved ineligible, and 90% of the remainder declined to participate. Mean age of participants was 60 +/- 10 years. Attendance at yoga classes was 7 around 50%. Nobody did the exercises regularly at home. Yoga teachers felt that most participants were unsuitable for 'standard' yoga exercises because of limited flexibility, lack of basic fitness, co-morbidity, and lack of confidence. There was a small fall in HbA1c in the yoga group which was not statistically significant and which was not sustained six months later, and no significant change in other outcome measures. The benefits of yoga in type 2 diabetes suggested in some previous studies were not confirmed. Possible explanations (apart from lack of efficacy) include recruitment challenges; practical and motivational barriers to class attendance; physical and motivational barriers to engaging in the exercises; inadequate intensity and/or duration of yoga intervention; and insufficient personalisation of exercises to individual needs. All these factors should be considered when designing future trials.

Butler, (2008), A small trial of type 2 patients from London's Yoga Biomedical Trust found that a 12-week yoga program helped reduce fasting blood glucose and hemoglobin AlC levels; the much larger Medicare Demonstration Project, which tracked more than 2,000 people with heart disease who did yoga and made other lifestyle changes for a year, saw similar results in participants who had diabetes, after both 12 weeks and 1 year researchers at the University College of Medical Sciences in Delhi, India, have found, through various studies, that daily yoga classes can decrease

fasting blood glucose, blood glucose after meals, hemoglobin A1C, systolic and diastolic blood pressure, and also improve insulin resistance.

Pratima, et al., (2008), tested efficacy of regular practice of 'suryanamaskar' in improving the cardio-respiratory fitness. The present study was conducted on 78 subjects, (48 males and 30 females). It was observed that 6 months of suryanamaskar practice decreases resting pulse rate and blood pressure. At the same time it increases cardio-respiratory efficiency and respiratory capacity as evaluated by bicycle ergometer and various lung functions tests, in both male and female subjects. From this study we conclude that suryanamaskar practice can be advocated to improve cardio-respiratory efficiency for patients as well as healthy individuals.

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 variables of interest were measured at the beginning (day 1) and end (day 10) of the intervention using a pre-post design. Setting: The study is the result of operational research carried out in our Integral Health Clinic (IHC). The IHC is an outpatient facility which conducts 8-day lifestyle modification programs based on yoga for prevention and management of chronic disease. A new course begins every alternate week of the year. The study is based on data collected on 98 subjects (67 male, 31 female), ages 20-74 years, who attended one of our programs. The subjects were a heterogeneous group of patients with hypertension, coronary artery disease, diabetes mellitus, and a variety of other illnesses. The intervention consisted of asanas (postures), pranayama (breathing exercises), relaxation techniques, group support, individualized advice, lectures and films on the philosophy of

yoga and the place of yoga in daily life, meditation, stress management, nutrition, and knowledge about the illness. The outcome measures were fasting plasma glucose and serum lipoprotein profile. These variables were determined in fasting blood samples, taken on the first and last day of the course. Fasting plasma glucose, serum total cholesterol, low-density lipoprotein (LDL) cholesterol, very- LDL cholesterol, the ratio of total cholesterol to high density lipoprotein (HDL) cholesterol, and total triglycerides 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. The observations suggest that a short lifestyle modification and stress management education program leads to favorable metabolic effects within a period of 9 days.

Sinha, et al., (2004), observed critically the energy cost and different cardiorespiratory changes during the practice of SN. Twenty-one male volunteers from the Indian Army practiced selected Yogic exercises for six days in a week for three months duration. The Yogic practice schedule consisted of Hatha Yogic Asanas (28 min), Pranayama (10.5 min) and Meditation (5 min). In the Yogic practice schedule 1st they practiced Kapal Bhathi (breathing maneuvers) for 2 min then Yogamudra (yogic postural exercise) for 2 min, after that they took rest until oxygen consumption and heart rate (HR) came to resting value. Subsequently subjects performed SN for 3 min 40 seconds on an average. After three months of training at the beginning of the fourth month subjects performed entire Yogic practice schedule in the laboratory as they practiced during their training session and experiments were carried out. Their pulmonary ventilation, carbondioxide output, Oxygen consumption, HR and other cardiorespiratory

parameters were measured during the actual practice of SN. Oxygen consumption was highest in the eighth posture (1.22+/-0.073 1 min(-1)) and lowest in the first posture (0.35+/-0.02 1 min(-1)). Total energy cost throughout the practice of SN was 13.91 kcal and at an average of 3.79 kcal/min. During its practice highest HR was 101+/-13.5 b.p.m. As an aerobic exercise SN seemed to be ideal as it involves both static stretching and slow dynamic component of exercise with optimal stress on the cardiorespiratory system.

Penk, et al., (2004), done a research on "Heart Rate Dynamics during Three Forms of Meditation". The study contains the following. Objective: This study was designed to quantify and compare the instantaneous heart rate dynamics and cardiopulmonary interactions during sequential performance of three meditation protocols with different breathing patterns. Background: We analyzed beat-to-beat heartrate and continuous breathing signals from 10 experienced meditators (4 females; 6 males; mean age 42 years; range 29-55 years) during three traditional interventions: relaxation response, breath of fire, and segmented breathing**.** Results: Heart rate and respiratory dynamics were generally similar during the relaxation response and segmented breathing. We observed high amplitude, low frequency (approximately 0.05-0.1 Hz) oscillations due to respiratory sinus arrhythmia during both the relaxation response and segmented breathing, along with a significantly ($p<0.05$) increased coherence between heart rate and breathing during these two maneuvers when compared to baseline. The third technique, breath of fire, was associated with a different pattern of 62 response, marked by a significant increase in mean heart rate with respect to baseline ($p<0.01$), and a significant decrease in coherence between heart rate and breathing ($p<0.05$). Conclusions: These findings suggest that different meditative/breathing

protocols may evoke common heart rate effects, as well as specific responses. The results support the concept of a "meditation paradox," since a variety of relaxation and meditative techniques may produce active rather than quiescent cardiac dynamics, associated with prominent low frequency heart rate oscillations or increases in mean resting heart rate. These findings also underscore the need to critically assess traditional frequency domain heart rate variability parameters in making inferences about autonomic alterations during meditation with slow breathing.

Ray, et al., (2001), studied the effect 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 first 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 month 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 submaximal exercise, body flexibility were recorded. Psychological parameters like personality, learning, arithmetic and psychomotor ability, 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 submaximal level of exercise and in anaerobic threshold in the yoga group. Shoulder, hip, trunk and neck flexibility improved in the yoga group. There was

improvement in various psychological parameters like reduction in anxiety and depression and a better mental function after yogic practices.

Tran, et al., (2001), studied ten healthy, untrained volunteers (nine females and one male), ranging in age from 18-27 years, were studied to determine the effects of hatha yoga practice on the health-related aspects of physical fitness, including muscular strength and endurance, flexibility, cardiorespiratory fitness, body composition, and pulmonary function. Subjects were required to attend a minimum of two yoga classes per week for a total of 8 weeks. Each yoga session consisted of 10 minutes of pranayamas (breath-control exercises), 15 minutes of dynamic warm-up exercises, 50 minutes of asanas (yoga postures), and 10 minutes of supine relaxation in savasana (corpse pose). The subjects were evaluated before and after the 8-week training program. Isokinetic muscular strength for elbow extension, elbow flexion, and knee extension increased by 31%, 19%, and 28% ($p<0.05$), respectively, whereas isometric muscular endurance for knee flexion increased 57% ($p<0.01$). Ankle flexibility, shoulder elevation, trunk extension, and trunk flexion increased by 13% ($p<0.01$), 155% ($p<0.001$), 188% ($p<0.001$), and 14% ($p<0.05$), respectively. Absolute and relative maximal oxygen uptake increased by 7% and 6%, respectively ($p<0.01$). These findings indicate that regular hatha yoga practice can elicit improvements in the health-related aspects of physical fitness.

Prasad, et al., (1997), studied the short-term effects of 4 weeks of intensive yoga practice on physiological responses in six healthy adult female volunteers were measured using the maximal exercise treadmill test. Yoga practice involved daily morning and evening sessions of 90 minutes each. Pre- and post-yoga exercise performance was compared. Maximal work output (Wmax) for the group increased by 21%, with a significantly reduced level of oxygen consumption per unit work but without a concomitant significant change in heart rate. After intensive yoga training, at 154 W min(-1) (corresponding to 65 Wmax of the pre-yoga maximal exercise test) participants

could exercise more comfortably, with a significantly lower heart rate ($p < 0.05$), reduced minute ventilation ($p < 0.05$), reduced oxygen consumption per unit work ($p < 0.05$), and a significantly lower respiratory quotient ($p < 0.05$). The implications for the effect of intensive yoga on cardiorespiratory efficiency are discussed, with the suggestion that yoga has some transparently different quantifiable physiological effects to other exercises.

2.2. Studies Related to Biochemical Variables

Gordon, et al., (2012), studied the **y**oga has been shown to be a simple and economical therapeutic modality that may be considered as a beneficial adjuvant for type 2 diabetes mellitus. This study investigated the impact of Hatha yoga and conventional physical training (PT) exercise regimens on biochemical, oxidative stress indicators and oxidant status in patients with type 2 diabetes. This prospective randomized study consisted of 77 type 2 diabetic patients in the Hatha yoga exercise group that were matched with a similar number of type 2 diabetic patients in the conventional PT exercise and control groups. Biochemical parameters such as fasting blood glucose (FBG), serum total cholesterol (TC), triglycerides, low-density lipoprotein (LDL), very low-density lipoproteins (VLDL) and high-density lipoprotein (HDL) were determined at baseline and at two consecutive three monthly intervals. The oxidative stress indicators (malondialdehyde – MDA, protein oxidation – POX, phospholipase A2 – PLA2 activity) and oxidative status [superoxide dismutase (SOD) and catalase activities] were measured. The concentrations of FBG in the Hatha yoga and conventional PT exercise groups after six months decreased by 29.48% and 27.43% respectively ($P < 0.0001$) and there was a

significant reduction in serum TC in both groups (P < 0.0001). The concentrations of VLDL in the managed groups after six months differed significantly from baseline values (P = 0.036). Lipid peroxidation as indicated by MDA significantly decreased by 19.9% and 18.1% in the Hatha yoga and conventional PT exercise groups respectively (P < 0.0001); whilst the activity of SOD significantly increased by 24.08% and 20.18% respectively (P = 0.031). There was no significant difference in the baseline and 6 months activities of PLA2 and catalase after six months although the latter increased by 13.68% and 13.19% in the Hatha yoga and conventional PT exercise groups respectively (P = 0.144).The study demonstrate the efficacy of Hatha yoga exercise on fasting blood glucose, lipid profile, oxidative stress markers and antioxidant status in patients with type 2 diabetes and suggest that Hatha yoga exercise and conventional PT exercise may have therapeutic preventative and protective effects on diabetes mellitus by decreasing oxidative stress and improving antioxidant status.

Dhananjai, et al., (2011), find out whether yoga practices have any effect on reducing the risk factors of obesity. 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 indicates usefulness of yoga practices in reducing obesity and reduces risk factors associated with obesity. The findings of this study may useful in management of obesity without any side effects.

Vedamurthachar, et al., (2011), studied the effect of an advanced Sudarshan Kriya Yoga practice as a complementary therapy for 6 days. Open label intervention study. Art of living international ashram. Subjects: 50 type 2 diabetic patients (22-69 yr). Advanced SKY workshop of 6 days (Sudarshan Kriya and its accompanying practices (SK&P), taught by the Art of Living Foundation world-wide, are stress management/health promotion techniques whose health benefits are being validated by modern medical science) Plasma cholesterol, HDL, triglycerides, LDL and VLDL, FT4 and prolactin, cortisol, TSH. In the participants, there was a significant decrease in plasma cholesterol ($p<0.03$), increase in HDL ($p<0.0001$), but levels of triglycerides, LDL and VLDL remained unaffected ($p>0.05$). Further, levels of FT4 and prolactin significantly increased while cortisol levels were significantly decreased ($p< 0.05$). plasma levels of TSH remained unchanged ($p>0.19$). Conclusion: The action of SKY on

lipid profile and hormonal status was of counteractive nature and felt to be distinctly different than the effect of drugs.

Nakhjavani, et al., (2008), conducted the study was Serum Oxidized-LDL is Associated with Diabetes Duration Independent of Maintaining Optimized Levels of LDL-Cholesterol. Oxidized low-density lipoprotein (ox-LDL) plays a key role in the progression of atherosclerosis and diabetes complications. The aim of this study was first, to evaluate the association between ox-LDL and diabetes duration, and second, to examine serum level of ox-LDL in patients with prolonged diabetes and a desirable LDL-cholesterol level. A total of 36 type-2 diabetic patients with diabetes duration of more than 5 years, 36 newly diagnosed diabetic patients, and 36 age-, sex- and BMI matchedhealthy participants were recruited. Healthy participants and newly diagnosed patients were not receiving any treatment. All patients with prolonged diabetes had desirable LDL-cholesterol levels (<100 mg/dl), according to the adult treatment panel-III guidelines. While LDL-cholesterol was significantly lower in patients with diabetes duration >5 years, in comparison to newly diagnosed patients ($P < 0.01$), ox-LDL was significantly higher in patients with prolonged diabetes ($P < 0.001$). The ox-LDL-to-LDL ratio was dramatically higher in patients with diabetes duration >5 years in comparison to newly diagnosed patients and healthy participants ($P < 0.001$). Ox-LDL was significantly associated with diabetes duration ($r = 0.519$, $P = 0.001$). In multivariate analysis, this association remained significant (beta = 0.501, $P = 0.003$) after adjustment for potential confounders. The conclusion of the study showed that the serum ox-LDL level increases with the length of diabetes, even though the patients' LDL-cholesterol level is maintained

at a desirable level. Our findings highlight that possibly more attention should be focused on markers of oxidative stress in the management of lipids in diabetic patients.

Danucalov, et al., (2008), done a research on "Cardiorespiratory and Metabolic Changes during Yoga Sessions: The Effects of Respiratory Exercises and Meditation Practices". The study contains the following. The novelty of this study was to investigate the changes in cardiorespiratory and metabolic intensity brought about by the practice of pranayamas (breathing exercises of yoga) and meditation during the same hatha-yoga session. The technique applied was the one advocated by the hatha-yoga system. Nine yoga instructors-five females and four males, mean age of 44+/-11, 6, were subjected to analysis of the gases expired during three distinct periods of 30 min: rest, respiratory exercises and meditative practice. A metabolic open circuit computerized system was applied (VO2000, Med Graphics-USA). The oxygen uptake (VO2) and the carbon dioxide output (VCO (2)) were statistically different (P <or= 0.05) during 67 meditation and pranayama practices when compared with rest. The heart rate also suffered relevant reductions when results at rest were compared with those during meditation. A smaller proportion of lipids were metabolized during meditation practice compared with rest. The results suggest that the meditation used in this study reduces the metabolic rate whereas the specific pranayama technique in this study increases it when compared with the rest state.

Yang, (2007), done a research on "A Review of Yoga Programs for Four Leading Risk Factors of Chronic Diseases". The study contains the following. Yoga, a form of physical activity, is rapidly gaining in popularity and has many health benefits.

Yet healthcare providers have been slow to recognize yoga for its ability to improve health conditions, and few interventions have been developed that take full advantage of its benefits. The purpose of this article is to review published studies using yoga programs and to determine the effect of yoga interventions on common risk factors ofchronic diseases (overweight, hypertension, high glucose level and high cholesterol). Asystematic search yielded 32 articles published between 1980 and April 2007. The studies found that yoga interventions are generally effective in reducing body weight, blood pressure, glucose level and high cholesterol, but only a few studies examined long-term adherence. Additionally, not enough studies included diverse populations at high risk for diabetes and its related common health problems.

Innes, and Vincent, (2007), studied effects of yoga-based programs on physiologic and anthropometric risk profiles and related clinical outcomes in adults with DM 2. We performed a comprehensive literature search using four computerized English and Indian scientific databases. The search was restricted to original studies (1970-2006) that evaluated the metabolic and clinical effects of yoga in adults with DM 2. Studies targeting clinical populations with cardiovascular disorders that included adults with comorbid DM were also evaluated. Data were extracted regarding study design, setting, target population, intervention, comparison group or condition, outcome assessment, data analysis and presentation, follow-up, and key results, and the quality of each study was evaluated according to specific predetermined criteria. We identified 25 eligible studies, including 15 uncontrolled trials, 6 non-randomized controlled trials and 4 randomized controlled trials (RCTs). Overall, these studies suggest beneficial changes in several risk

indices, including glucose tolerance and insulin sensitivity, lipid profiles, anthropometric characteristics, blood pressure, oxidative stress, coagulation profiles, sympathetic activation and pulmonary function, as well as improvement in specific clinical outcomes. Yoga may improve risk profiles in adults with DM 2, and may have promise for the prevention and management of cardiovascular complications in this population. However, the limitations characterizing most studies preclude drawing firm conclusions. Additional high-quality RCTs are needed to confirm and further elucidate the effects of standardized yoga programs in populations with DM 2.

Yadav, et al., (2005), done a research on "Effect of a Comprehensive Yoga-Based Lifestyle Modification Program on Lipid Peroxidation". The study contains the following. Oxidative stress contributes to the process of aging as well as a variety of chronic degenerative diseases. There are indications that psychological stress increases oxidative stress whereas relaxation decreases it. We have measured the concentration of thiobarbituric acid reactive substances (TBARS) in blood as an indicator of oxidative stress at the beginning and at the end of a comprehensive yoga-based lifestyle modification program (YLMP). The data was collected from 104 subjects (59 male, 45 female), 19-71 years of age (mean +/- SD, 41.2 +/- 14.6 years). The YLMP consisted of a nine-day educational out-patient 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 (a relaxation technique), and individual counseling. Venous blood samples were collected on the first and last day of the course. The serum

concentration of TBARS decreased significantly from 1.72 +/- 0.72 nmoles/ml on day 1 to 1.57 +/- 0.72 nmoles/ml on day 10 (P<0.05). The study suggests that a brief low cost lifestyle intervention based on yoga reduces oxidative stress.

Turk, et al., (2002), studied the diabetes is associated with a significant increase in thiobarbituric acid reactive substances (TBARS) which are considered as an index of endogenous lipid peroxidation. The human body has a complex antioxidant defense system that prevents the initiation of free radical chain reactions. We measured plasma TBARS levels, superoxide dismutase (SOD) and catalase (CAT) activities and compared their relation to the metabolic control of diabetes and diabetic microangiopathy. Sixty-four patients (19 men), aged 52.35+/-9.31 years with type 2 diabetes mellitus were included in the study. Thirty-six healthy subjects (12 men), aged 51.02+/-7.01 years formed the control group. TBARS levels and SOD activity were elevated in the diabetic group when compared with the control group (p<0.001 and p<0.00001, respectively). However CAT activity was significantly decreased in the diabetic group when compared with the control group (p<0.00001). Patients with diabetic nephropathy and retinopathy, but not neuropathy, had elevated TBARS levels but there was no statistically significant difference when compared with diabetic patients without microangiopathy (p>0.05). There was a positive correlation between plasma TBARS levels and SOD activity (r=0.770, p=0.0001) and a negative correlation between plasma TBARS levels and CAT activity (r=0.482, p=0.0001). There was also a negative correlation between SOD and CAT activities (r=-0.609, p=0.0001). We found significantly elevated TBARS levels in diabetic patients. We did not observe any

correlation between TBARS levels and blood glucose and HbA(1c) levels. Elevated TBARS levels and SOD activity and decreased CAT activity may be due to a compensation mechanism of the body.

2.3. Studies Related to Psychological Variables

Hegde, et al., (2011), assessed the effect of yoga on anthropometry, blood pressure, glycemic control, and oxidative stress in type 2 diabetic patients on standard care in comparison with standard care alone. The study involved 123 patients stratified according to groups with microvascular complications, macrovascular complications, and peripheral neuropathy and without complications and assigned to receive either standard care or standard care along with additional yoga for 3 months In comparison with standard care alone, yoga resulted in significant reduction in BMI, glycemic control, and malondialdehyde and increase in glutathione and vitamin C. There were no differences in waist circumference, waist-to-hip ratio, blood pressure, vitamin E, or superoxide dismutase in the yoga group at follow-up. Yoga can be used as an effective therapy in reducing oxidative stress in type 2 diabetes. Yoga in addition to standard care helps reduce BMI and improve glycemic control in type 2 diabetic patients.

Yang, et al, (2009), Various modes of physical activity, combined with dieting, have been widely recommended to prevent or delay type 2 diabetes. Among these, yoga holds promise for reducing risk factors for type 2 diabetes by promoting weight loss, improving glucose levels and reducing blood pressure and lipid levels. This pilot study aimed to assess the feasibility of implementing a 12-week yoga program among adults at high risk for type 2 diabetes. Twenty-three adults (19 Whites and 4

non-Whites) were randomly assigned to the yoga intervention group or the educational group. The yoga group participated in a 3- month yoga intervention with sessions twice per week and the educational group received general health educational materials every 2 weeks. All participants completed questionnaires and had blood tests at baseline and at the end of 3 months. Effect sizes were reported to summarize the efficacy of the intervention. All participants assigned to the yoga intervention completed the yoga program without complication and expressed high satisfaction with the program (99.2%). Their yoga session attendance ranged from 58.3 to 100%. Compared with the education group, the yoga group experienced improvements in weight, blood pressure, insulin, triglycerides and exercise self-efficacy indicated by small to large effect sizes. This preliminary study indicates that a yoga program would be a possible risk reduction option for adults at high risk for type 2 diabetes. In addition, yoga holds promise as an approach to reducing cardiometabolic risk factors and increasing exercise self-efficacy for this group.

Sinha, et al., (2004), observed critically the energy cost and different cardiorespiratory changes during the practice of SN. Twenty-one male volunteers from the Indian Army practiced selected Yogic exercises for six days in a week for three months duration. The Yogic practice schedule consisted of Hatha Yogic Asanas (28 min), Pranayama (10.5 min) and Meditation (5 min). In the Yogic practice schedule 1st they practiced Kapal Bhathi (breathing maneuvers) for 2 min then Yogamudra (yogic postural exercise) for 2 min, after that they took rest until oxygen consumption and heart rate (HR) came to resting value. Subsequently subjects performed SN for 3 min 40 seconds on an average. After three months of training at the beginning of the fourth month

subjects performed entire Yogic practice schedule in the laboratory as they practiced during their training session and experiments were carried out. Their pulmonary ventilation, carbondioxide output, Oxygen consumption, HR and other cardiorespiratory parameters were measured during the actual practice of SN. Oxygen consumption was highest in the eighth posture (1.22+/-0.073 1 min(-1)) and lowest in the first posture (0.35+/-0.02 1 min(-1)). Total energy cost throughout the practice of SN was 13.91 kcal and at an average of 3.79 kcal/min. During its practice highest HR was 101+/-13.5 b.p.m. As an aerobic exercise SN seemed to be ideal as it involves both static stretching and slow dynamic component of exercise with optimal stress on the cardiorespiratory system.

2.4.Study Yogic Therapy on Selected Variables

Sharma and Knowlden, (2012), suggested as a complementary and alternative treatment for type 2 diabetes mellitus. The purpose of this study was to review studies using yoga in preventing or controlling diabetes. Inclusion criteria were as follows: (1) conducted between 1993 and September 2011; (2) published in the English language; (3) used yoga *asanas*, *pranayama*, or *dhyana* as intervention; (4) involved diabetic patients and healthy volunteers, with insulin or glucose levels as outcomes, or individuals at risk for diabetes; (5) used any quantitative design; and (6) had biochemical, physiological, anthropometric, or clinical outcomes. A total of 17 studies met the inclusion criteria. Of these studies, 15 used yoga *asanas*, 12 used *pranayama*, and 1 each used *shatkriyas* (cleansing exercises) and yoga *nidra* (relaxation). Of the 11 studies that measured changes in fasting blood glucose, 9 showed significant decrease. Limitations include lack of theory-based approach, small sample sizes, and inability to gauge adherence.

Thangapandiyan, et al.,(2012), studied about 80% of type 2 diabetes mellitus is either preventable or controllable by changing diet, increasing physical activity and improving lifestyle. This research study investigated the role of the brisk walking and yogic exercises on fasting blood glucose levels among adult males with type 2 diabetes mellitus. 20 male diabetic patients were enrolled in the study and randomly allocated into two interventional groups. Study participants in group 1 underwent brisk walking intervention and study participants in group 2 underwent yoga intervention for 60 minutes daily between 6 am to 7 am for 15 consecutive days. The fasting blood glucose levels of study participants were measured using a calibrated glucometer. Significant reduction ($p<0.05$) in fasting blood glucose level of participants has been seen in both groups on the 15th day of intervention from its baseline value. The findings conclude that yogic exercises and brisk walking have enhanced the blood glucose lowering capacity among diabetic patients with pharmacological treatment and may be practiced as an adjuvant therapy for type 2 diabetic populations to reduce or prevent long-term complications.

Telles, et al., (2011), studied the pre and post comparison after one minute of high frequency yoga breathing (HFYB) suggested that the HFYB modifies the autonomic status by increasing sympathetic modulation, but its effect during the practice was not assessed. Thirty-eight male volunteers with group average age ± S.D., 23.3 ± 4.4 years were each assessed on two separate days in two sessions, (i) HFYB and (ii) breath awareness. Each session was for 35 minutes, with 3 periods, i.e., pre (5 minutes), during HFYB or breath awareness (15 minutes) and post (5 minutes). There was a significant decrease in NN50, pNN50 and the mean RR interval during and after HFYB and after

breath awareness, compared to the respective 'pre' values ($p < 0.05$) (repeated measures ANOVA followed by post-hoc analysis). The LF power increased and HF power decreased during and after breath awareness and LF/HF ratio increased after breath awareness ($p < 0.05$). The results suggest that there was reduced parasympathetic modulation during and after HFYB and increased sympathetic modulation with reduced parasympathetic modulation during and after breath awareness.

Frank, (2011), studied the type 2 diabetes is a global public health crisis that threatens the economies of all nations, particularly developing countries. Fueled by rapid urbanization, nutrition transition, and increasingly sedentary lifestyles, the epidemic has grown in parallel with the worldwide rise in obesity. Asia's large population and rapid economic development have made it an epicenter of the epidemic. Asian populations tend to develop diabetes at younger ages and lower BMI levels than Caucasians. Several factors contribute to accelerated diabetes epidemic in Asians, including the “normal-weight metabolically obese” phenotype; high prevalence of smoking and heavy alcohol use; high intake of refined carbohydrates (e.g., white rice); and dramatically decreased physical activity levels. Poor nutrition in utero and in early life combined with overnutrition in later life may also play a role in Asia's diabetes epidemic. Recent advances in genome-wide association studies have contributed substantially to our understanding of diabetes pathophysiology, but currently identified genetic loci are insufficient to explain ethnic differences in diabetes risk. Nonetheless, interactions between Westernized diet and lifestyle and genetic background may accelerate the growth of diabetes in the context of rapid nutrition transition. Epidemiologic studies and randomized clinical trials show that type 2 diabetes is largely preventable through diet

and lifestyle modifications. Translating these findings into practice, however, requires fundamental changes in public policies, the food and built environments, and health systems. To curb the escalating diabetes epidemic, primary prevention through promotion of a healthy diet andpublic policy priority.

Hayes and Chase, (2010), done a research on "Prescribing Yoga". The study contains the following. More than 15.8 million people in the United States now practice some form of yoga, and nearly half of current practitioners stated they began yoga practice as a means of improving overall health. More broadly understood in a modern context, yoga is a set of principles and practices designed to promote health and well-being through the integration of body, breath, and mind. This article outlines the history of yoga and describes several forms, including asana-based yoga, which is becoming popular in the United States. Research findings related to use of yoga as a therapy for various health problems are reviewed. Guidelines for finding a yoga teacher are offered, as are a number of book and Internet sources of further information.

Joshi and Telles, (2009), conducted to compare the P300 event-related potentials recorded before and after (1) high-frequency yoga breathing (HFYB) and (2) breath awareness. The P300 was recorded in participants of two groups before and after the intervention session (1 minute in duration). All participants were receiving yoga training in a residential yoga center, Swami Vivekanada Yoga Research Foundation in Bangalore, India. Thirty (30) male participants formed two groups (n = 15 each) with comparable ages (within an age range of 20-35 years) and comparable experience of the two techniques, the minimum experience being 3 months. The two groups were each given a separate intervention. One group practiced a HFYB at a frequency of

approximately 2.0 Hz, called kapalabhati. The other group practiced breath awareness during which participants were aware of their breath while seated, relaxed. The P300 event-related potential, which is generated when attending to and discriminating between auditory stimuli, was recorded before and after both techniques. The P300 peak latency decreased after HFYB and the P300 peak amplitude increased after breath awareness. Both practices (HFYB and Breath awareness), though very different, influenced the P300. HFYB reduced the peak latency, suggesting a decrease in time needed for this task, which requires selective attention. Breath awareness increased the P300 peak amplitude, suggesting an increase in the neural resources available for the task.

Bushell, (2009), studied the meditation, yogic breath control practices, physical exercises (of both a postural- and movement-based, including aerobic nature), and dietary practices. While each of these component categories exhibit variations in different schools, lineages, traditions, and cultures, the focus of this chapter is primarily on basic forms of relaxation meditation and breath control, as well as postural and aerobic physical exercises (e.g., yogic prostration regimens, see below), and a standard form of yogic or ascetic diet, all of which constitute a basic form of regimen found in many if not most cultures, though with variations.

Alexander, et al., (2008), article provides a review of literature both to identify the effects of yoga-based therapy on the management of type 2 diabetes mellitus and to examine the social context of physical activity. Findings from the review indicate that yoga has a positive short-term effect on multiple diabetes-related outcomes; however, long-term effects of yoga therapy on diabetes management remain unclear. The context of the social environment, including interpersonal relationships, community

characteristics, and discrimination, influences the adoption and maintenance of health behaviors such as physical activity, including yoga practice. Further research is necessary to determine the extent of this influence.

Malhotra, et al., (2002), done a research on "Effect of Yoga Asanas on Nerve Conduction in Type 2 Diabetes". The study contains the following. Twenty Type 2diabetic subjects between the age group of 30-60 years were studied to see the effect of 40 days of Yoga asanas on the nerve conduction velocity. The duration of diabetes ranged from 0-10 years. Subject suffering from cardiac, renal and proliferative retinal complications were excluded from the study Yoga asanas included Suryanamaskar, Tadasana, Konasan, Padmasan Pranayama, Paschimottanasana, Ardhmatsyendrasan, Shavasan, Pavanmukthasan, Sarpasan and Shavasan. Subjects were called to the cardiorespiratory laboratory in the morning time and were given training by the Yoga expert. The Yoga exercises were performed for 30-40 minutes every day for 40 days in the above sequence. The subjects were prescribed certain medicines and diet. The basal blood glucose, nerve conduction velocity of the median nerve was measured and repeated after 40 days of Yogic regime. Another group of 20 Type 2 diabetes subjects of comparable age and severity, called the control group, were kept on prescribed medication and light physical exercises like walking. Their basal & post 40 day's parameters were recorded for comparison. Right hand and left hand median nerve conduction velocity increased from 52.81 +/- 1.1 m/sec to 53.87 +/- 1.1 m/sec and 52.46 +/- 1.0 to 54.75 +/- 1/1 m/sec respectively. Control group nerve function parameters deteriorated over the period of study, indicating that diabetes is a slowly progressive disease involving the nerves. Yoga asanas have a beneficial effect on glycemic control

and improve nerve function in mild to moderate Type 2 diabetes with sub-clinical neuropathy.

Sahay and Sahay, (2002), India has the largest diabetic population in the world. Change in eating habits, increasing weight and decreased physical activity are major factors leading to increased incidence of type 2 diabetes. Obesity is the most important modifiable risk factor. Smoking is an independent risk factor for type 2 diabetes mellitus. Diet and exercise are primary therapeutic options for its management. Dietary management should not only aim to achieve glycaemic control but to normalise dyslipidaemia. Smoking cessation reduces the risk of morbidity and mortality in CAD. Exercise improves the condition of a diabetic patient. Exercise includes yoga practices which have a role to play in the prevention of type 2 diabetes.

Fall CHD, (2001), studied the prevalence of type 2 diabetes is rising rapidly in all non-industrialised populations. By 2025, three-quarters of the world's 300 million adults with diabetes will be in non-industrialised countries and almost a third in India and China alone. There is strong evidence that this epidemic has been triggered by social and economic development and urbanisation, which is associated with general improvements in nutrition and longevity, but also with obesity, reduced physical exercise and other diabetogenic factors. There is evidence too that fetal growth retardation and growth failure in infancy, both still widespread in non industrialised populations, increase susceptibility to diabetes. An additional factor may be intergenerational effects of gestational diabetes occurring in mothers who grew poorly in early life and become obese as adults. Prevention of type 2 diabetes will require measures to promote exercise and

reduce obesity in adults and children, alongside programmes to achieve healthy fetal and infant growth.

Raghuraj, et al., (1998), The heart rate variability (HRV) is an indicator of the cardiac autonomic control. Two spectral components are usually recorded, viz. high frequency (0.15-0.50 Hz), which is due to vagal efferent activity and a low frequency component (0.05-0.15 Hz), due to sympathetic activity. The present study was conducted to study the HRV in two yoga practices which have been previously reported to have opposite effects, viz, sympathetic stimulation (kapalabhati, breathing at high frequency, i.e., 2.0 Hz) and reduced sympathetic activity (nadisuddhi, alternate nostril breathing). Twelve male volunteers (age range, 21 to 33 years) were assessed before and after each practice on separate days. The electrocardiogram (lead I) was digitized on-line and off-line analysis was done. The results showed a significant increase in low frequency (LF) power and LF/HF ratio while high frequency (HF) power was significantly lower following kapalabhati. There were no significant changes following nadisuddhi. The results suggest that kapalabhati modifies the autonomic status by increasing sympathetic activity with reduced vagal activity. The study also suggests that HRV is a more useful psychophysiological measure than heart rate alone.**Error! Reference source not found.Error! Reference source not found.**

Zimmet, et al., (1997), Non-insulin-dependent diabetes mellitus (NIDDM) constitutes about 85% of all cases of diabetes in developed countries and it has now reached epidemic proportions in many developing nations, as well as disadvantaged groups in developed countries, e.g., Mexican- and African-Americans and Australian Aborigines and Torres Strait Islanders. The diagnosis of NIDDM is usually made after

the age of 50 years in Europids, but it is seen at much younger age in these high prevalence populations, which also include Pacific Islanders, Native Americans, and migrant Asian Indians and Chinese. There is enormous variation in NIDDM prevalence between populations, and exceptionally high rates have been documented in populations who have changed from a traditional to a modern lifestyle, e.g., American Pima Indians, Micronesians, and other Pacific Islanders, Australian Aborigines, migrant Asian Indians, and Mexican-Americans. Over the next decade, following the initial phase of the NIDDM epidemic, macro- and microvascular complications will emerge as a major threat to future public health throughout the world with huge economic and social costs. The major cause of death in NIDDM is macrovascular disease (coronary artery, peripheral vascular, and cerebrovascular), which accounts for at least two-thirds of NIDDM mortality. A key strategy in reducing macrovascular disease lies in the better understanding of the Deadly Quartet or Metabolic Syndrome. New data suggest that hyperleptinemia rather than hyperinsulinemia may play an important and central role in the genesis of the cardiovascular disease risk factor cluster that constitutes the Metabolic Syndrome.

Jaim, et al., (1993), studied the changes in blood glucose and glucose tolerance by oral glucose tolerance test (OGTT) after 40 days of yoga therapy in 149 non-insulin-dependent diabetics (NIDDM) were investigated. The response to yoga in these subjects was categorized according to a severity scale index (SSI) based on area index total (AIT) under OGTT curve. One hundred and four patients showed a fair to good response to the yoga therapy. There was a significant reduction in hyperglycemia and AIT with decrease in oral hypoglycemia and AIT with decrease in oral hypoglycemic

drugs required for maintenance of normoglycemia. It is concluded that yoga, a simple and economical therapy, may be considered a beneficial adjuvant for NIDDM patients.

2.5 Study Alternative Therapy on Selected Variables

Sabeeha Shafi, et al., (2012), Diabetic Nephropathy is defined as a persistent albuminuria and more commonly diagnosed by a urinary excretion of more than 300 mg/24 hour. It develops in around one third of patients with diabetes, with the Asia-Pacific region being the most severely affected. It is one of the causes of renal failure and end-stage renal disease. Factors like smoking and diastolic blood pressure have been found to be associated with microalbuminuria. Oxidative stress may play a key role in the pathogenesis of diabetic nephropathy. Role of traditional herbs and medicines in the treatment of diabetic nephropathy needs attention especially in India, where certain fruits and herbs are thought to have positive effects on health. Certain herbs such as *Anacardium occidentale*, *Benincasa cerifera, Brassica oleracea* and *Terminalia chebula* etc. have shown positive effects in diabetic nephropathy. The enormous cost of modern medicines indicate that alternative strategies are required for better management of diabetes. The study of herbal medicines might offer a natural key to unlock a diabetologists pharmacy for the future.

Verma, et al., (2010), Diabetes mellitus is a global disease found in all nations of the world. Various attempts have been made in search of suitable formulation for diabetes mellitus. Although allopathic treatment helps to control the disease to an extent but regular medication and constant medical supervision some time leads to non patient compliance and compels them to look for alternative measures. Herbal treatment

seems to be promising, as scientific analysis of several plants reveal that they posses enormous therapeutic capabilities that modern medicines is searching for. Moreover, due to affordability especially in developing countries where resources are meager and where the coverage by health service is limited, more researchers are now working in this direction. This paper provides a general account of different managements with main focus on scope of herbal drugs and a comprehensive analysis of plants that may provide insights for future study and development of herbal drugs in modern scientific perspective.

Garrow and Egede, (2006), determined national patterns and correlates of complementary and alternative medicine (CAM) use among adults with diabetes. The authors compared CAM use in 2474 adults with and 28,625 adults without diabetes who participated in the most comprehensive national survey on CAM use (2002 National Health Interview Survey). Eight CAM use categories were created, including dietary, herbal, chiropractic, yoga, relaxation, vitamin, prayer, and other (acupuncture, Ayurveda, biofeedback, chelation, energy healing or Reiki therapy, hypnosis, massage, naturopathy, and homeopathy). An overall CAM use category also was created that excluded vitamins and prayer. Patterns of use were compared with chisquare and independent correlates of CAM use with multiple logistic regression controlling for relevant covariates. STATA was used for analysis to account for the complex survey design. Prevalence of overall use of CAM did not differ significantly by diabetes status (47.6 versus 47.9%, p = 0.81). Diabetes was not an independent predictor of overall use of CAM (OR 0.93, 95% confidence interval [CI] 0.83, 1.05). However, persons with diabetes were more likely to use prayer (OR 1.19, 95% CI 1.05, 1.36), but less likely to use herbs (OR 0.86, 95% CI

0.75, 0.99), yoga (OR 0.56, 95% CI 0.43, 0.72), or vitamins (OR 0.82, 95% CI 0.72, 0.93) than people without diabetes after controlling for relevant covariates. Independent correlates of overall use of CAM differed by age, income, employment, comorbidity, and health status between people with and without diabetes. This study found that there has been a dramatic increase in overall use of CAM in adults with diabetes; diabetes was not an independent predictor of overall use of CAM; and people with diabetes were more likely to use prayer, but less likely to use herbs, yoga, or vitamins compared to persons without diabetes.

Head, (2006), studied the peripheral neuropathy (PN), associated with diabetes, neurotoxic chemotherapy, human immunodeficiency virus (HIV)/antiretroviral drugs, alcoholism, nutrient deficiencies, heavy metal toxicity, and other etiologies, results in significant morbidity. Conventional pain medications primarily mask symptoms and have significant side effects and addiction profiles. However, a widening body of research indicates alternative medicine may offer significant benefit to this patient population. Alpha-lipoic acid, acetyl-Lcarnitine, benfotiamine, methylcobalamin, and topical capsaicin are among the most well researched alternative options for the treatment of PN. Other potential nutrient or botanical therapies include vitamin E, glutathione, folate, pyridoxine, biotin, myo-inositol, omega-3 and -6 fatty acids, L-arginine, L-glutamine, taurine, N-acetylcysteine, zinc, magnesium, chromium, and St. John's wort. In the realm of physical medicine, acupuncture, magnetic therapy, and yoga have been found to provide benefit. New cutting-edge conventional therapies, including dual-action peptides, may also hold promise.

Elder, (2004), studied the diabetes mellitus is a condition that is extremely serious from both clinical and public health standpoints. The traditional healthcare system of India, Ayurveda, offers a balanced and holistic multi-modality approach to treating this disorder. Many Ayurvedic modalities have been subjected to empirical scientific evaluation, but most such research has been done in India, receiving little attention in North America. This paper offers a review of the English language literature related to Ayurveda and diabetes care, encompassing herbs, diet, yoga, and meditation as modalities that are accessible and acceptable to Western clinicians and patients. There is a considerable amount of data from both animal and human trials suggesting efficacy of Ayurvedic interventions in managing diabetes. However, the reported human trials generally fall short of contemporary methodological standards. More research is needed in the area of Ayurvedic treatment of diabetes, assessing both whole practice and individual modalities.

Go Vl and Champaneria, (2002), throughout past millennia, human beings have shared the common goal of improving health for longevity. However, different cultures around the world have developed their own approaches to achieve this goal. Various traditions have emerged, rendering distinct medical systems such as Ayurveda, Yoga, Chinese-Japanese medicine, shamanism, and Native American healing. Traditional medicine involves a holistic approach to the human body to integrate healing with culture, environment, and tradition. Modern allopathic medicine originated from Greco-Roman Medicine and Northern European traditions and is built on the science of anatomy, physiology, and biochemistry and the structure function relationship between cells, tissues, and organs. This foundation focuses on diagnosis, treatment, and cure for

acute illnesses via potent pharmaceutical drugs, surgery, radiation, and other treatment modalities. Within this past century, we have doubled the life-span of human beings. Genomic medicine, including stem cell research, cloning, and gene therapy, will increase our capability to treat even more diseases. In the new millennium, we face more chronic illnesses related to aging, environment, and lifestyle, such as cancer, diabetes. osteoporosis, and cardiovascular diseases. Thus, health care providers face the challenge of prospecting for health and disease prevention. Modern science and medical advancements provide the rationale for the integration of various traditional healing techniques, which have been termed Alternative and Complementary Medicine, to promote healing, health, and longevity. Advances in medicine must include the holistic approach of traditional medicine to face the current challenges in health care. Therefore, the New World of Medicine must fuse the antiquity of ancient healing with the innovations of modern medicine to increase life-expectancy and improve quality of life throughout the world.

2.6 Summary of Literature

The reviews are presented under the two sections namely studies related to physiological variables (n = 14), biochemical variables (n = 9), psychological variables (n = 3), yoga therapy on selected variables (n=14) and alternative therapy on selected variables (n=6). All the research studies that are presented in this section prove that alternative and yoga therapy methods contribute significantly for better improvement in all the criterion variables.

Research studies using yoga therapy revealed compatible results **Hegde, et al., (2011), Ebnezar, et al., (2012), Sharma and Knowlden, (2012), Dhananjai, et al., (2011), Gordon, et al., (2012), Brown and Gerbarg, (2005),** and **Skoro, et al., (2009)**. There was clear evidence that the use of yoga therapy was one of the effective training methods to improve the selected criterion variables.

Research studies using alternative therapy revealed compatible results **Sabeeha Shafi, et al. (2012)**, **Verma, et al., (2010), Garrow and Egede, (2006), Head, (2006), Elder, (2004)**, **Go Vl and Champaneria, (2002).** The current study created varma therapy programme to determine its effectiveness as a tool for selected physiological, bio-chemical and psychological variables among diabetic patients.

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 finding out the training. The present study may serve as a foundation and main ingredient for future research and investigation in training methods for changing the physiological, psychological and bio-chemical variables.