CHAPTER II

REVIEW OF RELATED LITERATURE

A study of relevant literature is an essential step to get a full picture of what has been done with regard to the problem under study. Such a review also brings out a deep and clear perspective of the overall field.

The relevant literature pertaining to the present study has been abstracted in this chapter to provide the background material to evaluate the significance of this study as well as to interpret its findings. The researcher have gone through several books, periodicals, journals, published and unpublished theses, while searching for relevant facts and only those findings related to this present study have been carefully chosen and presented here for the better understanding and to justify the study.

The purpose of this review of selected literature was to relate studies pertaining to the topic under study and to organize the collected review into meaningful sub sections as listed below:

I. Studies on yoga with Physiological Variables

II. Studies on yoga with Hematological Variables

III. Studies on yoga with Psychological Variables

2.1 STUDIES ON YOGA WITH PHYSIOLOGICAL VARIABLES

Bharadwj, Ishwar et al. (2013) investigated a study on "Effect of Yogic Intervention on Blood pressure and Alpha EEG level of working women." Fifty working women in the age group of 25-39 years were selected and divided in to experimental and control group, each group containing twenty five working women.

Both the groups underwent test for homogeneity before starting the practice. Control research design was used for the study. Duration of the practice was 45 days and 60 minutes each morning. Post test was taken for both the groups after 45 days again. The result of t-test revealed that the yogic intervention have significant effect on blood pressure and Alpha- EEG level of working women at .01 level.

Papp, ME. et al. (2013) conducted a study on "Increased heart rate variability but no effect on blood pressure from 8 weeks of hatha yoga – a pilot study." Twelve healthy women and men took part in an 8-week yoga program. The yoga program was conducted once a week, 60 minutes a day. Blood Pressure and Heart Rate variability were measured. The result shows that there was no significant effect of inversion postures on Blood Pressure. Nine out of 12 participants showed a significant increase in Heart Rate variability at night on pNN50%. There were no significant changes in other Heart Rate variability measures. It was concluded that Eight weeks of hatha yoga improved Heart Rate variability significantly which suggests an increased vagal tone and reduced sympathetic activity.

Sarvottam, K. et al. (2013) did a study on "Adiponectin, interleukin-6, and cardiovascular disease risk factors are modified by a short-term yoga-based lifestyle intervention in overweight and obese men." Pre-post nonrandomized prospective lifestyle intervention design was used. Fifty one overweight and obese men were selected for the study. A pretest was conducted. Intervention program included asanas, pranayama, group discussions, lectures, and individualized advice. The primary outcome measure was weight loss, and the secondary outcome measures were clinical and laboratory correlates of cardiovascular disease risk, levels of interleukin-6, adiponectin and endothelin-1.

These findings suggest that even a short-term yoga-based lifestyle intervention may be an important modality to reduce the risk for cardiovascular disease as indicated by weight loss, reduction in systolic blood pressure, an increase in adiponectin, and decrease in interleukin-6 in overweight and obese men.

Ye, Y. et al. (2013) performed a study on "Association between Subclinical Hypothyroidism and Blood Pressure-A Meta-Analysis of Observational Studies." The meta-analysis intended to demonstrate the relationship between subclinical hypothyroidism and blood pressure. A systematic search of databases was performed to identify all the related cross-sectional studies and baseline data in prospective cohort studies in the general population. Weighted mean differences of systolic blood pressure and diastolic blood pressure between subclinical hypothyroidism and euthyroid were calculated. Subgroup analysis and meta-regression were used to explore the potential heterogeneity between studies. Twenty studies with 50,147 individuals were included. Significant heterogeneity was indentified among the included studies. Subgroup analysis showed that differences in study design, gender, and thyroid-stimulating hormone cutoff level were not associated with weighted mean differences of systolic blood pressure, except for age difference between subclinical hypothyroidism and euthyroid groups. Meta-regression showed a significant association between weighted mean differences of systolic blood pressure and age difference between the two groups. In this meta-analysis, subclinical hypothyroidism was associated with slightly higher systolic blood pressure, which could be attributed to the age difference between subclinical hypothyroidism and euthyroid groups in general population. However, this study did not exclude an association between subclinical hypothyroidism and blood pressure. Prospective studies are needed to confirm this conclusion.

Tundwala et al. (2012) carried out a study on "Effect of yoga and various asanas on obesity, hypertension and dyslipidemia." After screening inclusion and exclusion criteria for obesity, hypertension and dyslipidemia 150 patients were selected for this study. The duration of the study was 3 months. After the training period, the clinical data was again recorded for comparison. The result shows that there were significant decrease in the parameters of obesity namely body mass index and waist hip ratio, and also the result shows that there was a significant improvement in hypertension both systolic and diastolic blood pressure, decrease in total cholesterol, low-density lipoprotein, triglycerides, very low-density lipoprotein and increase in high-density lipoprotein in study group as compared to control group.

Monika et al. (2012) investigated a study on "Effect of Yoga Nidra on physiological variables in patients of menstrual disturbances of reproductive age group." Hundred and fifty females with menstrual irregularities with 28.08 +/- 7.43 years of mean age were selected for the study. Subjects were divided randomly in to intervention and control group of 75 in each group. Out of these, 126 completed the study protocol. The yogic intervention was carried out for 35 to 40 minutes a day, five days a week, up to six months. An autonomic function testing was done in both the groups at zero time and after six months. A significant positive effect was observed when yoga therapy was used as an adjunct in the patients of menstrual disturbances. There were significant improvements in the blood pressure, postural hypotension and sustained hand grip, heart rate, expiration inspiration ratio and 30:15 beat ratios of the subjects after yogic practice.

Bhavanani AB et al. (2012) performed a study on "Immediate effect of chandra nadi pranayama (left unilateral forced nostril breathing) on cardiovascular

parameters in hypertensive patients". Twenty two patients of essential hypertension under regular standard medical management were individually taught to perform chandra nadi pranayama by a qualified yoga instructor with a regularity of 6 breaths per minute throughout a performance of 27 rounds of chandra nadi pranayama. Pre and post intervention heart rate and blood pressure measurements were recorded using non-invasive semi-automatic Blood Pressure monitor and Students 't' test for paired data used to determine significant differences. It is concluded that chandra nadi pranayama is effective in reducing heart rate and Systolic Pressure in hypertensive patients on regular standard medical management. Further studies are required to enable a deeper understanding of the mechanisms involved as well as determine how long such a blood pressure lowering effect persists.

Khetmalis, MS (2012) investigated a study on the "Effect of Ujjayi and Bhastrika Pranayama on selected physiological variables of physically challenged students". Sixty students were selected as the subjects for the study. The age ranged between 15 to 20 years. The students were randomly assigned as experimental and controlled group; each group consisted of 30 students. The variables selected for the study were vital capacity, breath holding time, resting pulse rate, blood pressure. The study was conducted for a period of 6 weeks. The pretest and post test were conducted. The students went through a program for five days a week. Independent t-test was carried out for the two groups at 0.05 level of significance. The study revealed that vital capacity and positive breath holding time had significant results after 6 weeks training program of ujjayi and bhastrika pranayama.

Field, T. (2012) performed a study on "Prenatal exercise research." In this review of recent research on prenatal exercise, studies from several different countries suggest that only approximately 40% of pregnant women exercise, even though about

92% are encouraged by their physicians to exercise, albeit with some 69% of the women being advised to limit their exercise. A moderate exercise regime reputedly increases infant birth weight to within the normal range, but only if exercise is decreased in late pregnancy. Lower intensity exercise such as water aerobics has decreased low back pain more than land-based physical exercise. Heart rate and blood pressure have been lower following yoga than walking, and complications like pregnancy-induced hypertension with associated intrauterine growth retardation and prematurity have been less frequent following yoga. Potential underlying mechanisms for exercise effects are that stimulating pressure receptors during exercise increases vagal activity which, in turn, decreases cortisol, increases serotonin and decreases substance P, leading to decreased pain. Decreased cortisol is particularly important inasmuch as cortisol negatively affects immune function and is a significant predictor of prematurity. Larger, more controlled trials are needed before recommendations can be made about the type and amount of pregnancy exercise.

Devasena, Indla. and Narhare, Pandurang. (2011) carried out a study on "Effect of yoga on heart rate and blood pressure and its clinical significance." Healthy volunteers above the age of 40 years were selected as subjects. The cardiovascular status of the subjects was assessed clinically in terms of resting heart rate and blood pressure before the start of yoga practice and again after 6 months. The results were compared and analyzed with respect to age, sex and body mass index. From the study it was observed that significant reduction in the heart rate occurs in the subjects practicing yoga. The systolic blood pressure was lowered to a highly significant level. The diastolic blood pressure was reduced significantly. This shows that the yoga provides significant improvement in ageing to reduce the morbidity and mortality from cardiovascular diseases.

Cai, Y. et al. (2011) conducted a study on "Blood pressure levels in patients with subclinical thyroid dysfunction: a meta-analysis of cross-sectional data." A meta-analysis of all cross-sectional studies was performed to compare the blood pressure levels in patients with subclinical thyroid dysfunction with those of healthy controls. A computer-based online retrieval of databases and manual searches were undertaken to identify articles that addressed the association between subclinical thyroid dysfunction and blood pressure levels and were published through 2010, using no language restrictions. The meta-analysis was performed using STATA 11. Seven cross-sectional studies were examined. In patients with subclinical hypothyroidism, the pooled estimate of the weighted mean difference of increased blood pressure revealed a significant difference in both systolic blood pressure and diastolic blood pressure. However, in patients with subclinical hyperthyroidism, the pooled estimate of the weighted mean difference of increased blood pressure revealed no significant difference in systolic blood pressure or diastolic blood pressure. The present meta-analysis indicates that subclinical hypothyroidism is associated with increased systolic blood pressure and diastolic blood pressure, whereas subclinical hyperthyroidism is not. Further investigation is needed to confirm blood pressure levels in patients with subclinical thyroid dysfunction.

Kumari, N Suchetha et al. (2011) investigated a study on "Effect of yoga therapy on body mass index and oxidative status." Forty obese male and female were selected as subjects. The changes in body weight, body mass index, blood sugar, MDA level and total antioxidant status was estimated before and after one month of yoga therapy. The data was analyzed using paired 't' test at 0.05 level of significance. There was a significant decline in the body weight, body mass index, fasting blood sugar and post prandial blood sugar, MDA and significant increase in total antioxidant

level after yoga when compared to that before the yoga therapy. Yoga therapy is beneficial in maintaining better health by regulating body mass index, oxidative status by improving the biochemical functions of the body and helpful to overcome the complications of obesity.

Herur, Anita. et al. (2011) carried out a study on "Effect of body mass index and gender on the cardiovascular and mental response to yoga." This comparative study was done in 50 subjects. Age of the subjects were more than 30 years, which included 28 male and 22 female, and 27 with body mass index< 25 and 23 with body mass index≥ 25. All the parameters were recorded before and after 6 months of regular yogic practice. The mean decrease in the resting heart rate, diastolic blood pressure and general health questionnaire 28 score, after 6 months of regular yoga practice, was more in females and in the group with body mass index≥ 25, whereas the mean decrease in the systolic blood pressure was equal in both genders and more in the group with body mass index≥ 25. It can be concluded that yoga practice can be used as an intervention in ageing persons to reduce the morbidity and mortality from cardiovascular diseases, irrespective of age, gender and more so in subjects with body mass index ≥ 25.

Moliver, N. et al. (2011) carried out a study on "Increased Hatha yoga experience predicts lower body mass index and reduced medication use in women over 45 years." Online surveys were administered to 211 female yoga practitioners aged from 45 to 80 years. Regression analyses were used to evaluate the relationship of extent of yoga experience to both body mass index and medication use after accounting for age and lifestyle factors. Comparisons were also conducted with 182 matched controls. Participants had practiced yoga for as long as 50 years and for up to 28 hours per week. There were significant inverse relationships between yoga

experience and both body mass index and medication load. These significant relationships remained after accounting for age and lifestyle factors. There was no obesity in the 49 participants with more than 25 years of yoga practice. Yoga practitioners were less likely than non-practitioners to use medication for metabolic syndrome, mood disorders, inflammation, and pain. A long-term yoga practice was associated with little or no obesity in a non-probability sample of women over 45 years. Relationships showed a dose-response effect, with increased yoga experience predicting lower body mass index and reduced medication use.

Yeh, GY. et al. (2008) performed a study on "Tai chi exercise for patients with cardiovascular conditions and risk factors: A systematic review." Researchers searched various database sources and also searched various Chinese medical databases. Clinical studies published in English and Chinese including participants with established cardiovascular disease or cardiovascular disease risk factors were included for the study. Data were extracted in a standardized manner. Two independent investigators assessed methodological quality, including the Jadad score for randomized controlled trials. Twenty-nine studies met inclusion criteria, nine randomized controlled trials, 14 nonrandomized studies, and six observational trials. Three studies examined subjects with coronary heart disease, five in subjects with heart failure, and ten in heterogeneous populations that included those with cardiovascular disease. Eleven studies examined subjects with cardiovascular risk factors (hypertension, dyslipidemia, impaired glucose metabolism). Study duration ranged from eight weeks to three years. Most studies included fewer than 100 subjects. Six of nine randomized controlled trials were of adequate quality. Most studies reported improvements with tai chi, including blood pressure reductions and increases in exercise capacity. No adverse effects were reported. Preliminary evidence

suggests that tai chi exercise may be a beneficial adjunctive therapy for some patients with cardiovascular disease and cardiovascular risk factors. Further research is needed.

Leung, YW. et al. (2008) carried out a study on "The prevalence and correlates of mind-body therapy practices in patients with acute coronary syndrome." Six hundred and sixty one in-patients with acute coronary syndrome were recruited from three hospitals, completed a demographic survey. Clinical data were extracted from charts. Four hundred and sixty five patients responded to an 18-month post-discharge survey that queried about mind-body therapy use and its correlates. One hundred and sixty-three acute coronary syndrome patients practiced mind-body therapy in their lifetime, and 118 were currently practicing. Mind-body therapy users were more often women. They were nonwhite, had higher levels of education and also past smokers who reported poorer mental health, and engaged in more exercise. One-third of acute coronary syndrome patients practiced some form of Mind-body therapy. The greater Mind-body therapy practice among female coronary syndrome patients is noteworthy, given their generally lower physical activity and lower receipt of evidence-based treatments including cardiac rehabilitation. In addition, there is some evidence that mind-body therapy can promote mental well-being, and thus such practice might reduce risk related to negative effect in cardiac patients.

Blank, Sally E. (2006) carried out a study on "Physiological Responses to Iyengar Yoga Performed by Trained Practitioners." Intermediate or advanced level female yoga practitioners were monitored for heart rate, oxygen uptake, and brachial arterial blood pressure during a 90 minute practice. The subjects aged 43.5 ± 6.9 years had current weekly practice of 6.2 ± 2.4 hour per week with practice history of 9.2 ±

7.2 year. Physical characteristics of the subjects included: height, body mass, and percent body fat. The supine, seated, standing, inversions, and push up to back arch asanas were included in the practice and the poses were maintained for 1 to 5 minutes. Physiological responses were significantly greater in standing asanas, inversions, and push up to back arch versus supine and seated asanas. The average metabolic equivalent of each pose did not exceed 5 metabolic equivalents. The practice expended 149.4 ± 50.7 Kilo calories. The cumulative time spent within a heart rate zone of 55-85%. Heart rate max was 29.7 ± 15.9 min. Asana practice was classified as mild to moderate intensity exercise without evidence of a sustained cardiopulmonary stimulus. Intermediate and advanced practitioners maintained poses for up to 5 minutes without stimulating an undesirable pressure response. It was concluded that the postural alignment significantly influenced blood pressure responses indicating that adherence to precise alignment has relevant physiological consequences for the yoga practitioner.

Poobalan, A. et al. (2004) carried out a study on "Effects of weight loss in overweight/obese individuals and long-term lipid outcomes--a systematic review." A systematic review of long-term lipid outcomes of weight loss in studies published between 1966 and 2001 was conducted. Inclusion criteria included all cohort studies and trials carried out on participants with body mass index of greater than or equal to 28 kg m(-2). Studies had at least two weight change measurements and follow-up of more than 2 years. Thirteen long-term studies with a follow-up of more than 2 years were included. Cholesterol has a significant positive linear relationship with weight change where change in weight explains about 80% of the cholesterol difference variation. For every 10 kg weight loss a drop of 0.23 mmol L(-1) in cholesterol may be expected for a person suffering from obesity or are grossly overweight. Weight

loss has long-term beneficial effects especially on low density lipoprotein and cholesterol. Weight loss in obese patients should be encouraged and sustained.

Astin, JA. et al. (2003) conducted a study on "Mind-body medicine: state of the science, implications for practice." The literature was reviewed to examine the efficacy of representative psychosocial-mind-body interventions, including relaxation, behavioral therapies, meditation, imagery, biofeedback, and hypnosis for several common clinical conditions. An electronic search was undertaken and a manual search of the reference sections of relevant articles for related clinical trials and reviews of the literature. Studies examining mind-body interventions for psychological disorders were excluded. Data were extracted from relevant systematic reviews, meta-analyses, and randomized controlled trials. Drawing principally from systematic reviews and meta-analyses, there is considerable evidence of efficacy for several mind-body therapies in the treatment of coronary artery disease (for example cardiac rehabilitation), headaches, insomnia, incontinence, chronic low back pain, disease and treatment-related symptoms of cancer, and improving postsurgical outcomes. The researchers were found moderate evidence of efficacy for mind-body therapies in the areas of hypertension and arthritis. Additional research is required to clarify the relative efficacy of different mind-body therapies, factors (such as specific patient characteristics) that might predict more or less successful outcomes, and mechanisms of action. Research is also necessary to examine the cost offsets associated with mind-body therapies. There is now considerable evidence that an array of mind-body therapies can be used as effective adjuncts to conventional medical treatment for a number of common clinical conditions.

Biondi, B. et al. (2002) conducted a study on "Subclinical hypothyroidism and cardiac function." The cardiovascular system is sensitive to the action of thyroid hormone. Most clinical studies have shown that subclinical hypothyroidism or hyperthyroidism is associated with changes in several cardiac parameters. More specifically, the literature on cardiac involvement in subclinical hypothyroidism consistently shows that patients have resting left ventricular diastolic dysfunction evidenced by delayed relaxation, and impaired systolic dysfunction on effort that results in poor exercise capacity. Whether or not, subclinical hypothyroidism also affects left ventricular systolic function at rest remains controversial. Studies of subclinical hypothyroid patients before and after euthyroidism were achieved with levothyroxine replacement provided evidence of impaired resting left ventricular systolic function. Indeed, at-rest left ventricular systolic function was substantially normal in most studies of subclinical hypothyroid patients compared to normal control subjects. Drawing on these data, it appears that subclinical hypothyroidism should be considered a mild form of thyroid failure, associated with initial signs of cardiovascular hypothyroidism. Therefore, it would seem appropriate to initiate timely treatment of patients with mild thyroid failure to prevent cardiac involvement.

Biondi, B. et al. (2002) investigated a study on "Effects of subclinical thyroid dysfunction on the heart." Mounting evidence indicates that subclinical thyroid dysfunction has important clinical effects and prognostic implications, supporting the view that it is not a compensated biochemical change sensu strictu. Aim of the study was to review clinical information on the effects of subclinical thyroid dysfunction on the heart. Various data sources were used. Data on cardiac structure and performance, arrhythmias, and risk for coronary artery disease were independently assessed by all authors and summarized. Subclinical hypothyroidism is associated with impaired left

ventricular diastolic function at rest, systolic dysfunction on effort, and enhanced risk for atherosclerosis and myocardial infarction. Subclinical hyperthyroidism is associated with increased heart rate, atrial arrhythmias, increased left ventricular mass with marginal concentric remodeling, impaired ventricular relaxation, reduced exercise performance, and increased risk for cardiovascular death. All abnormalities were reversed by restoration of euthyroidism (subclinical hypothyroidism) or were blunted by beta-blockade and tailoring of the l - thyroxine dose (subclinical hyperthyroidism). The heart responds to the minimal but persistent changes in circulating thyroid hormone levels typical of subclinical thyroid dysfunction. Thus, the condition is not a compensated biochemical change sensu strictu, and timely treatment should be considered in an attempt to avoid adverse cardiovascular effects.

Luskin, FM. et al. (1998) carried out a study on "A review of mind-body therapies in the treatment of cardiovascular disease. Part 1: Implications for the elderly." A review of research on complementary and alternative treatments, specifically mind-body techniques, was conducted at Stanford University. Computerized searches were conducted and interviews conducted with practitioners. All studies since 1990 that examined mind-body treatments of cardiovascular disorders in the elderly were included. Mind-body practices evaluated were social support, cognitive-behavioral treatment, meditation, the placebo effect, hope, faith, imagery, spiritual healing, music therapy, hypnosis, yoga, t'ai chi, qigong and aikido. Studies conducted after 1990 were a priority, but when more recent literature was scarce, other studies using randomized, controlled trials were included. Mind-body techniques were found to be efficacious primarily as complementary and sometimes as stand-alone alternative treatments for cardiovascular disease-related conditions. Studies provided evidence for treatment efficacy, but the need for further controlled

research was evident. There is a lack of replicated studies with which to determine appropriate treatment dosage and the mechanisms by which many of the practices work. Compelling anecdotal evidence, the presence of some controlled research, overall cost effectiveness, and the lack of side effects resulting from mind-body treatments make further investigation a high priority.

Latha and KV Kalliappan (1991) conducted a study on "Yoga, Pranayama, Thermal Biofeedback Techniques in the Management of Stress and High Blood Pressure." The sample of the study consisted of 14 essential hypertensive patients. Seven of these patients underwent training in yoga and thermal biofeedback technique for a period of six months. Other seven patients served as a comparison group. Results showed a significant reduction in the systolic blood pressure during treatment phases. Moderate reduction in the diastolic pressure was noticed, only when the thermal feedback was introduced. This also corresponded to significant reduction in the intake of anti-hypertensive drugs. Training in yoga and thermal biofeedback procedures were not effective in altering the perceptions associated with stressful experiences.

2.2 STUDIES ON YOGA WITH HEMATOLOGICAL VARIABLES

Rani, M. et al. (2013) performed a study on "Impact of Yoga Nidra on Menstrual Abnormalities in Females of Reproductive Age." Randomized controlled design was used for the study. Subjects were divided randomly into an intervention and a control group, with 75 subjects in each group. Of these subjects, 126 completed the study protocol. This study involved 150 subjects with menstrual irregularities; 126 of whom completed the protocol. The intervention was the practice of Yoga Nidra. The yogic intervention duration was 35 to 40 minutes a day, five times a week for 6 months. An estimation of hormonal profile was done for both groups at baseline and

after 6 months. Thyroid-stimulating hormone, follicle-stimulating hormone, luteinizing hormone, and prolactin were decreased significantly in the intervention group, compared with the control group. The present study demonstrated the efficacy of Yoga Nidra on hormone profiles in patients with menstrual irregularities. Yoga Nidra practice was helpful in patients with hormone imbalances, such as dysmenorrhea, oligomenorrhea, menorrhagia, metrorrhagia, and hypomenorrhea.

Bhavanani, **Madanmohan et al. (2013)** conducted a study on "Effects of eight week yoga therapy program on cardio vascular health in hypertensive's" Fifteen patients receiving standard medical treatment for essential hypertension were recruited. Anthropometric, cardiovascular and biochemical investigations were done before and after a comprehensive yoga therapy program. The yoga therapy program comprised of three times a week sessions for 8 weeks. A post intervention, retrospective wellness questionnaire was used to evaluate the comparative feelings of the patients after the therapy program. There was a statistically significant decrease in weight, body mass index and all resting cardiovascular parameters such as heart rate and blood pressure indices. Total cholesterol, triglyceride, low density and very low density lipoproteins reduced significantly while high density lipoprotein increased significantly. All the cholesterol based ratios such as total cholesterol to high density lipoprotein, low density lipoprotein to high density lipoprotein showed healthy improvements. Post intervention overall wellness scores of the participants indicated that 9% attained complete relief and total satisfaction after the therapy program while 29% were much better than before. Thirty six percent were better than before while 25% had no change in their condition. It is concluded that a comprehensive yoga therapy program has potential to enhance the beneficial effects of standard medical

management of essential hypertension and can be used as an effective complementary or integrative therapy program.

Rast, SD. et al. (2013) carried out a study on "the effect of yoga training on lipid profile and blood glucose in type II diabetic females." In this quasi-experimental study, 30 women with type II diabetes were randomly selected. Age of the subjects was between 45 to 60 years old and divided into experimental and control groups. Each group contained 15 subjects. Experimental group were subjected to regular yoga training for 8 weeks. Yoga training was for 3 sessions per week, 60 minutes per session. Control group did not have any regular activity. The dependent variables were total cholesterol, triglycerides, low density lipoprotein, high density lipoprotein, and blood glucose and were examined before and after yoga training in both the groups. Results indicated a significant difference in the changed levels of total cholesterol, triglycerides, low density lipoprotein, high density lipoprotein, and blood glucose between the control and experimental groups. Based on the results, it can be said that, yoga is a non-drug, non-invasive and cost-effective method to improve the quality of life.

Nidhi, Ram. et al. (2012) conducted a study on "Effects of a Holistic Yoga Program on Endocrine Parameters in Adolescents with Polycystic Ovarian Syndrome: A Randomized Controlled Trial." The objectives of this trial were to compare the effects of a holistic yoga program with the conventional exercise program in adolescent polycystic ovarian syndrome. This was a prospective, randomized, active controlled trial. Ninety adolescent girls from a residential college in Andhra Pradesh who satisfied the Rotterdam criteria were randomized into two groups. Age of the girls was from 15 to 18 years. The yoga group practiced a holistic yoga module, while the control group practiced a matching set of physical exercises. The training

program was for 12 weeks, one hour per day. Anti-müllerian hormone, luteinizing hormone, follicle-stimulating hormone, testosterone, prolactin, body–mass index, hirsutism, and menstrual frequency were measured at inclusion and after 12 weeks. Mann-Whitney test on difference score shows that changes in Anti-müllerian hormone, luteinizing hormone, and luteinizing hormone to follicle-stimulating hormone ratio were significantly different between the two intervention groups. Also, changes in testosterone and Modified Ferriman and Gallway score were significantly different between the two groups. A holistic yoga program for 12 weeks is significantly better than physical exercise in reducing Anti-müllerian hormone, luteinizing hormone, and testosterone, Modified Ferriman and Gallway score for hirsutism, and improving menstrual frequency with non significant changes in body weight, follicle-stimulating hormone, and prolactin in adolescent girls with Polycystic Ovarian Syndrome.

Madanmohan et. al (2012) conducted a study on "Effect of yoga therapy on reaction time, biochemical parameters and wellness score of peri and post-menopausal diabetic patients." Fifteen peri and post-menopausal patients were selected for the study. Subjects were receiving standard medical treatment for type 2 diabetes mellitus. Reaction time and biochemical investigations were done before and after a comprehensive yoga therapy program. yoga therapy program comprised three times a week sessions for six weeks. A post-intervention, retrospective wellness questionnaire compiled by Advanced Centre for Yoga Therapy Education and Research was used to evaluate the comparative feelings of the patients after the therapy program. Yoga training reduced auditory reaction time from right as well as left hand, the decrease being statistically significant for auditory reaction from the right hand. There was a significant decrease in fasting and postprandial blood glucose

levels as well as low density lipoprotein. The decrease in total cholesterol, triglycerides, and very low density lipoprotein and increase in high density lipoprotein was also statistically significant. All the lipid ratios showed desirable improvement with a decrease of total cholesterol to High-Density Lipoprotein and Low-Density Lipoprotein to High-Density Lipoprotein ratios and increase in the High-Density Lipoprotein to Low-Density Lipoprotein ratio.

Okonta, NR. (2012) performed a study on "Does yoga therapy reduce blood pressure in patients with hypertension?: an integrative review." The review was conducted with a search of computerized databases as well as reliable Web sites among others. An integrative review search was conducted, and 10 studies met the inclusion criteria. They include a combination of randomized controlled trials, quasi-experimental studies, and pilot studies. Yoga therapy is a multifunctional exercise modality with numerous benefits. Not only does yoga reduce high blood pressure but it has also been demonstrated to effectively reduce blood glucose level, cholesterol level, and body weight, major problems affecting the American society. The completed integrative review provides guidelines for nursing implementation as a complementary treatment of high blood pressure.

Singh, P. et al. (2011) carried out a study on "The impact of yoga upon female patients suffering from hypothyroidism." Objective of the study was to study the effect of yoga on the quality of life of female hypothyroid patients. The World Health Organization Quality of Life Scale (22) was used to assess the quality of life of 20 female hypothyroid patients. Subjects attended one hour yoga sessions daily, for a period of one month. A pretest-post-test research design was used for data analysis. Patients' quality of life scores following the yoga program were greater than scores obtained prior to undertaking yoga. Patients also reported significant improvement in

their perception of the overall quality of life and of their health post yoga intervention. It was concluded that yoga is valuable in helping the hypothyroid patients to manage their disease-related symptoms. Yoga may be considered as supportive or complementary therapy in conjunction with medical therapy for the treatment of hypothyroid disorder.

Luzina, KÉ. et al. (2011) investigated a study on "The influence of acupuncture on the quality of life and the level of thyroid-stimulating hormone in patients presenting with subclinical hypothyroidism." This study included 27 female patients who applied for medical treatment of arthralgias and myalgias. They were found to have elevated levels of thyroid-stimulating hormone in conjunction with the normal concentrations of thyroid hormones. The therapeutic procedures included corporal and auricular acupuncture, introduction of needles into the reflexogenic scalp and wrist zones (depending on clinical symptoms) and into the thyroid gland projection zones on the skin, massage of paravertebral regions of the cervical and thoracic spine using a bone scraper (the Gua Sha healing technique). Twenty of the 27 patients completed two therapeutic courses with a three to four month interval between them. The treatment resulted in a significant decrease of the number and severity of the initial clinical symptoms such as the levels of thyroid-stimulating hormone fell down to the physiological values, characteristics of the quality of life became comparable with those of healthy subjects. It is concluded that acupuncture may be regarded as an alternative to substitution therapy of subclinical hypothyroidism.

Pal, A. et al. (2011) studied about "Effect of yogic practices on lipid profile and body fat composition in patients of coronary artery disease." In this study, one hundred seventy subjects, of both sexes having coronary artery disease were randomly

selected. Subjects were randomly divided in to yoga group and non-yoga group, each group consisting of eighty five subjects. Out of these, 154 completed the study protocol. The yogic intervention consisted of 35 to 40 minutes a day, five days in a week till six months. Body fat testing and estimation of lipid profile were done of the both groups at zero time and after six months of yogic intervention in yoga group and without yogic intervention in non yoga group. In present study, reduction of systolic blood pressure, diastolic blood pressure, heart rate, body fat%, total cholesterol, triglycerides and Low-Density Lipoprotein after regular yogic practices is beneficial for cardiac and hypertensive patients.

Swami, G. et al. (2010) investigated a study on "Effect of yoga on pulmonary function tests of hypothyroid patients." Twenty hypothyroid females, with the 39.70 +/- 8.27 years of mean age were selected as subjects. Spiro metric recordings were taken with hypair (version-1.28). Baseline recordings were taken when patient came for the first time. Patients came to yoga lab in physiology department for 21 days continuously where they were trained by the yoga instructors and then told to do pranayama at home and called at regular intervals after seven days to see the compliance. The breathing exercises were done for 45 minutes every day. After six months of pranayama, second recording was taken and compared with the baseline. There were significant improvement in forced expiratory volume in first second (FEV1), Maximum voluntary ventilation and Inspiratory Capacity. Thus Pranayama and meditation has beneficial effect on pulmonary functions of hypothyroid patients along with conventional treatment.

Rodondi, N. et al. (2010) performed a study on "Subclinical hypothyroidism and the risk of coronary heart disease and mortality." The databases were searched without language restrictions for prospective cohort studies with baseline thyroid

function and subsequent coronary heart disease events, coronary heart disease mortality, and total mortality. The reference lists of retrieved articles also were searched. The risk of coronary heart disease events was examined in 25,977 participants from seven cohorts with available data. Among 55,287 adults, 3450 had subclinical hypothyroidism (6.2%) and 51,837 had euthyroidism. During follow-up, 9664 participants died (2168 of coronary heart disease), and 4470 participants had coronary heart disease events (among seven studies). The risk of coronary heart disease events and coronary heart disease mortality increased with higher thyroid-stimulating hormone concentrations. Total mortality was not increased among participants with subclinical hypothyroidism. Results were similar after further adjustment for traditional cardiovascular risk factors. Risks did not significantly differ by age, sex, or preexisting cardiovascular disease. Subclinical hypothyroidism is associated with an increased risk of coronary heart disease events and coronary heart disease mortality in those with higher Thyroid-Stimulating Hormone levels, particularly in those with a Thyroid-Stimulating Hormone concentration of 10 mIU/L or greater.

Kalyankumar and Jagannathareddy (2010) investigated a study on "Effect of cardio-respiratory endurance, anaerobic and yogasana on High-Density Lipoprotein and Low-Density Lipoprotein cholesterol levels among young men" Age of the subjects were from 18 to 22 years. Fifteen subjects were assigned to each of the four groups of experimentation by selecting the students on random basis and who volunteered. The groups were cardiorespiratory endurance group, anaerobic group and yogasana group. The training regimen consisted of clearly laid protocols of exercises for four different groups. For yogasana group, the protocol developed by Swami Shivananda of Rishikesh Ashram was used. Pre-training, resting High-Density

Lipoprotein and Low-Density Lipoprotein cholesterol levels and post-training values were measured and analysis of covariance statistical technique was used to analyze the results. Medium intensity cardio respiratory endurance training brought more significant increase in High-Density Lipoprotein cholesterol levels, though all the three types of protocols brought significant increase in the resting High-Density Lipoprotein cholesterol. Medium intensity cardio respiratory endurance training brought more significant reduction in Low-Density Lipoprotein cholesterol levels, though all the three types of protocols brought significant reduction in the resting Low-Density Lipoprotein cholesterol.

Xiang, GD. et al. (2009) conducted a study on "Regular aerobic exercise training improves endothelium-dependent arterial dilation in patients with subclinical hypothyroidism." Impairment of flow-mediated endothelium-dependent arterial dilation exists in patients with subclinical hypothyroidism. Thirty sedentary women with subclinical hypothyroidism and 27 sedentary healthy women with euthyroid were selected. All individuals participated in an exercise training of 6 months. Before and after exercise training, high resolution ultrasound was used to measure flow-mediated endothelium-dependent arterial dilation. After 6 months of exercise, there was a remarkable increase in flow-mediated endothelium-dependent arterial dilation (31.3%) and VO2 max, and significant decreases in total cholesterol (20%), low-density lipoprotein cholesterol (29%), triglycerides (47.6%), and C-reactive protein were observed over the exercise in patients with subclinical hypothyroidism. The absolute changes in flow-mediated endothelium-dependent arterial dilation showed significant correlation with changes in Low-Density Lipoprotein, triglycerides, and C-reactive protein and multiple regression analysis showed changes of Low-Density Lipoprotein, triglycerides, C-reactive protein were significant determinants of changes

of flow-mediated endothelium - dependent arterial dilation in subclinical hypothyroidism patients during exercise course. Regular aerobic exercise improves low-mediated endothelium-dependent arterial dilation in subclinical hypothyroidism patients, and changes of lipids and inflammation during the exercise period may partially contribute to the improvement of endothelial function.

Bablis, P. and Pollard, H. (2009) investigated a study on "Mind-body treatment for hypothyroid dysfunction." For many years hypothyroid dysfunction has been treated with standard medical approaches yet some seek newer experimental conservative approaches. This study describes the management of a new conservative approach to management in two individuals who sought treatment from a practitioner specializing in a new integrative mind-body based treatment. The purpose of this study is to present two case studies of the management of hypothyroid dysfunction using the mind-body neuro - emotional technique (NET). The study was set in a private practice setting in Sydney. Two cases had been diagnosed with primary hypothyroidism by independent medical and laboratory based assessment, of which conservative management had not resolved the symptoms. Both cases underwent a schedule of neuro - emotional technique as a modality to treat their hypothyroidism. Objective measures such as thyroid stimulating hormone and T4 levels were reported, along with more subjective measures such as feelings of tiredness and general well being. In both cases, there were improvements in Thyroid-Stimulating Hormone and T4 levels, both returning to normal levels. Thyroid dysfunction has been effectively treated by conventional medicine for many years. Changes in thyroid dysfunction after a course of neuro - emotional technique have been described. As the standard medical model is associated with some adverse effects such as long-term medication use and potential side effects, all natural, non-invasive approaches to management

should be reviewed. Further research into this mind-body therapy is recommended to evaluate its potential effectiveness for this common condition.

Vyas, R. et al. (2008) carried out a study on "Effect of Raja yoga meditation on the lipid profile of post-menopausal women." Forty nine normal female volunteers were selected as the subjects. They were divided into pre-menopausal, consisting of 23 subjects, and post-menopausal, consisting of 26 subjects, groups. They were further divided into non-meditators, short-term meditators (meditating for 6 months to 5 years) and long-term meditators (meditating for more than 5 years). Lipid profile was assessed using their respective reagent sets. Serum cholesterol, triglyceride and low-density lipoprotein in non - meditators were significantly more in post-menopausal women as compared to pre - menopausal women. Serum cholesterol and low density lipoprotein were significantly lowered in both short and long term meditators as compared to non - meditators 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 in post-menopausal women thus reducing the risk of coronary artery disease in them.

Kumar, M. et. al. (2008) conducted a study on "Effect of yoga life style intervention on body weight and blood chemistry of middle aged women" The sample for the study comprises of 50 females between the ages of 40 to 55 years. Sample was further divided into experimental group and control group, each consisting of 25 females. The subjects of the experimental group went through a Yogic intervention for six months under the direct supervision of researchers. The Control group was engaged in daily routine work. The subjects of both the groups were tested before and after the experimental period of three months. The data was analyzed statistically by applying t-test. The results show that the Yoga helped the experimental group

effectively in decreasing the body weight, total cholesterol, low density lipoprotein and triglycerides whereas on high-density lipoprotein, no significant effect was obtained. No significant changes were observed in the Control group. It is concluded that Yoga intervention helped in decreasing the body weight and improving the lipid profile of middle aged women which is beneficial for healthy life.

Galani, C. and Schneider, H. (2007) conducted a study on "Prevention and treatment of obesity with lifestyle interventions: review and meta-analysis." A systematic literature review with meta-analysis was performed. Electronic databases, reference lists, books and reports covering topic of obesity were searched. The included studies were randomized clinical trials of lifestyle interventions in overweight and obese subjects that had a minimum observation period of one year. Outcomes evaluated were measurements of body weight, body mass index, waist circumference, systolic and diastolic blood pressure, blood lipids: total cholesterol, low density lipoprotein, high density lipoprotein, triglyceride, blood glucose control: two-hour plasma glucose, fasting plasma glucose, and glycosylated haemoglobin. Thirteen studies have been selected in the prevention and seventeen in the treatment of obesity. Compared with standard care, lifestyle intervention reduced significantly body weight, body mass index, waist circumference, blood pressure, blood lipids and blood glucose in overweight and obese people. The favorable effects were maintained up to three years. Lifestyle interventions were efficacious in the mid- to long-term prevention and treatment of obesity leading to a significant reduction in body weight and cardiovascular risk factors.

Prasad, KVV. et al. (2006) carried out a study on "Impact of Pranayama and yoga on Lipid Profile in Normal Healthy Volunteers" The present study was conducted on normal healthy volunteers. The study group consisted of 41 men and 23

women. Objective of the study was 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 very low-density lipoprotein cholesterol in men and free fatty acids alone were reduced in women at the end of stage-I. A significant elevation of high density lipoprotein 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, low-density lipoprotein and very low-density lipoprotein cholesterol. The results indicated that high density lipoprotein cholesterol was elevated in men with Pranayamam, while triglycerides and low density lipoprotein cholesterol decreased in women after yoga asanas. The results of the present 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 etcetera.

Bijlani, RL. et al. (2005) conducted a study on "A Brief but Comprehensive Lifestyle Education Program Based on Yoga Reduces Risk Factors for Cardiovascular Disease and Diabetes Mellitus." The study is based on data collected on 98 subjects. They were 67 male and 31 female. They were aged between 20 to 74 years, who attended the 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, pranayama, 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 cholesterol, very low density lipoprotein cholesterol, the ratio of total cholesterol to high density lipoprotein cholesterol, and total triglycerides were significantly lower and high density lipoprotein 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 nine days.

Yadav, RK. et al. (2005) investigated a study on "Effect of a comprehensive yoga-based lifestyle modification program on lipid peroxidation." The investigators measured the concentration of thiobarbituric acid reactive substances in blood as an indicator of oxidative stress at the beginning and at the end of a comprehensive yoga-based lifestyle modification program. The data was collected from 104 subjects, consisting of 59 male and 45 female, in the age group of 19 to 71 (mean +/- SD, 41.2 +/- 14.6 years). The yoga-based lifestyle modification program 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 asanas, 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 serum concentration of thiobarbituric acid reactive substances decreased significantly. The study suggests that a brief low cost lifestyle intervention based on yoga reduces oxidative stress.

Ciloglu, Figen. et al. (2005) performed a study on "Exercise intensity and its effects on thyroid hormones." The effect of different intensity levels of acute aerobic exercise on thyroid hormones was investigated in 60 male well-trained athletes by performing bicycle ergometer at low intensity, moderate intensity, and high intensity. These intensities were selected according to their maximum heart rate. At each intensity level, heart rate, blood lactic acid, serum total thyroxine, free thyroxine, total triiodothyronine, free triiodothyronine and thyroid stimulating hormone values were measured. The results of this study show that exercise performed at the anaerobic threshold (70% of maximum heart rate, lactate level 4.59 ± 1.75 mmol/l) caused the most prominent changes in the amount of any hormone values. While the rate of serum total thyroxine, free thyroxine, and thyroid stimulating hormone continued to rise at 90% of maximum heart rate, the rate of triiodothyronine and triiodothyronine started to fall. Maximal aerobic exercise greatly affects the level of circulating thyroid hormones.

Carlson, LE. et al (2004) investigated a study on "Mindfulness-based stress reduction in relation to quality of life, mood, symptoms of stress and levels of cortisol, dehydroepiandrosterone sulfate and melatonin in breast and prostate cancer outpatients." Fifty-nine patients with breast cancer and ten with prostate cancer enrolled in an eight-week Mindfulness-Based Stress Reduction program that incorporated relaxation, meditation, gentle yoga, and daily home practice. Demographic and health behavior variables, quality of life, mood, stress, and the hormone measures of salivary cortisol were assessed three times a day; plasma dehydroepiandrosterone sulfate and salivary melatonin were assessed pre- and post-intervention. Significant improvements were seen in overall quality of life, symptoms of stress, and sleep quality, but these improvements were not significantly correlated

with the degree of program attendance or minutes of home practice. Mindfulness - Based Stress Reduction program enrollment was associated with enhanced quality of life and decreased stress symptoms in breast and prostate cancer patients, and resulted in possibly beneficial changes in hypothalamic-pituitary-adrenal axis functioning. These pilot data represent a preliminary investigation of the relationships between Mindfulness-Based Stress Reduction program participation and hormone levels, highlighting the need for better-controlled studies in this area.

Malhotra, V. et al. (2003) carried out a study on "Effects of yoga asanas and pranayama in non-insulin dependent diabetes mellitus." Twenty type 2 diabetic subjects between the age group of 30-60 years were studied to see the effect of 40 days of yoga asanas on biochemical profile. The duration of diabetes ranged from zero to ten years. Subjects suffering from cardiac, renal and proliferative retinal complications were excluded from the study. The yogic exercises were performed for 30 to 40 minutes every day for 40 days in the above sequence. The subjects were prescribed medicines and diet. The basal blood glucose, lipid profile and glycosylated hemoglobin was measured and repeated after 40 days of yoga asanas. There was a statistically significant decrease in fasting blood glucose and decrease in postprandial blood glucose. The decreases in values of serum cholesterol were also statistically significant. The triglyceride decreased, low density lipoprotein cholesterol and very low density lipoprotein improved. The glucosylated hemoglobin decreased. These findings suggest that yoga asanas have a beneficial effect on glycaemic control and lipid profile in mild to moderate type 2 diabetes.

Nithyanand, Latha. (1999) conducted a study on "An evaluation of yoga as a therapy for certain ailments." For this, the study included 88 patients with a definite medical diagnosis of a clinical disorder. Ten disorders were taken into account. Based

on the patient's physio-psychological constitution and reported symptoms, each patient was given individualized yoga training once a week for a period of three months. Each course designed consisted of asana and pranayama, which were modified and adapted to suit individual needs. Considering the progress during the period, the course was progressively changed. Weekly reports of the changes in the symptoms were noted down. The investigation involved a before and after Experimental design with repeated measures. For this a 'Paired t test', Friedman's Two Way ANOVA and One Way ANOVA were used according to the sample size. The results showed that Yoga is a potent therapeutic tool' for various conditions. Its adaptability makes it serve both as an Alternative as well as a Complementary Therapy. It also pointed to its holistic approach, where it showed that the therapy was not dependent upon the number of symptoms.

Mahajan, AS. et al. (1999) performed a study on "Lipid profile of coronary risk subjects following yogic lifestyle intervention." The parameters included the body weight, estimation of serum cholesterol, triglycerides, high density lipoprotein, low density lipoprotein and the cholesterol to high density lipoprotein ratio. A baseline evaluation was done and then the angina patients and risk factors subjects were randomly assigned as control (n = 41) and intervention (yoga) group (n = 52). 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 high density lipoprotein. 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.

Latha (1996) investigated a study on "BETHALS (Better Health by Alternative Life Styles)." The first phase of study involved training a batch of volunteers in various programs such as yogasana, pranayama, chanting, nutritional counseling etc., These highly motivated groups underwent training for a period of six months. The training sessions were held once a week, each session lasting approximately 3 hours and also many group sessions were held. Pre-training assessment in biomedical and psychological measures were carried out. A control - comparison group was also evaluated for their cardiac health status. Statistical analysis revealed an enhanced status in physical wellbeing, problem oriented approach in coping among trained group. Coronary risks reduced for yoga-trained group. They also showed significantly better cardiac status and compliance than the control group. This study proved that yoga can be a preventive and health promotion means for cardiac patients and risk group.

Rawal, SB. et al. (1994) conducted a study on "Effect of yogic exercises on thyroid function in subjects' resident at sea level upon exposure to high altitude". Using radioactive iodine, the effect of one month's yogic exercises has been investigated on the thyroid function of subjects' resident at sea level specially after their exposure to high altitude. The results have been compared with a group of sea level subjects who underwent physical training exercises for the same duration. Ten healthy male volunteers in the age range of 20 to 30 years were used as test subjects in this study with each serving as his own control. The subjects were randomly divided into two groups of five each. One group practiced hatha yogic exercises, while the other group performed the regular physical training exercises. The thyroidal

accumulation and release of radioactive iodine have been measured in each of the subjects of both groups before and after one month of their respective exercises at sea level. One month of yogic exercises at sea level has been observed to cause a significant reduction in the trans-thyroidal availability of radioiodine. The thyroid radioactivity in this group of subjects was always below normal levels with the exception of two peaks of radioactive iodine uptake, when the levels of radioactivity in the thyroid were similar to the control values of pre-yogic exercises. The release of radiolabel at 24 to 48 hour was significantly increased after yogic exercises. In contrast, the subjects performing physical training exercises for the same duration at sea level showed significant thyroid uptake of radioactive iodine at 24 hour. Subsequently their 131I uptake continued to rise slowly until 72 hour without any demonstrable thyroidal release of radiolabel. This indicated that increased thyroid activity was induced by conventional physical training exercise.

2.3. STUDIES ON YOGA WITH PSYCHOLOGICAL VARIABLES

Telles, Shirley et al. (2013) studied about the "Effect of yoga or physical exercise on physical, cognitive and emotional measures in children: a randomized controlled trial." Ninety eight school children between eight to 13 years were randomized as yoga and physical exercise groups. Yoga group consisted of fifteen girls. Physical exercise group consisted of 23 girls. Both groups were blind assessed after allocation. After initial assessments, the yoga group practiced yoga for 45 minutes each day, five days a week. During this time the physical exercise group had jogging-in-place, rapid repetitive movements and relay races or games. Both groups were assessed at the end of three months. Data were analyzed with repeated measures analysis of variance and post-hoc tests were Bonferroni adjusted. There was one significant difference between groups. This was in social self-esteem which

was higher after physical exercise compared to yoga. All the changes reported are based on after-before comparisons, within each group. Both groups showed an increase in body mass index, and number of sit-ups. Balance worsened in the physical exercise group, while plate tapping improved in the yoga group. In the Stroop task, both groups showed improved color, word- and color-word naming, while the physical exercise group showed higher interference scores. Total, general and parental self-esteem improved in the yoga group. Yoga and physical exercise are useful additions to the school routine, with physical exercise improving social self-esteem.

Lakkireddy D. et al. (2013) studied about "Effect of yoga on arrhythmia burden, anxiety, depression, and quality of life in paroxysmal atrial fibrillation: the YOGA My Heart Study. This single-center, pre-post study enrolled patients with symptomatic paroxysmal atrial fibrillation with an initial three-month non interventional observation period followed by twice-weekly 60-minutes yoga training for next three months. Atrial fibrillation episodes during the control and study periods as well as short form-36 scores at baseline, before, and after the study phase were assessed. Yoga training reduced symptomatic atrial fibrillation episodes, symptomatic non-atrial fibrillation episodes, asymptomatic atrial fibrillation episodes, and depression and anxiety, and improved the quality of life parameters of physical functioning, general health, vitality, social functioning, and mental health domains on short form-36. There was significant decrease in heart rate, and systolic and diastolic blood pressure before and after yoga. In patients with paroxysmal atrial fibrillation, yoga improves symptoms, arrhythmia burden, heart rate, blood pressure, anxiety and depression scores, and several domains of quality of life.

Parswani, Manish J. et al. (2013) studied about "Mindfulness-based stress reduction program in coronary heart disease: A randomized control trial."

Intervention was carried out at an outpatient clinic were parallel group - Mindfulness-based stress reduction group; and treatment-as-usual group. Randomized control design with pretest and posttest intervention and follow-up assessments was adopted. Thirty male patients, age ranging 30 to 65 years with coronary heart disease were randomly allocated to either group. The therapeutic program comprised of eight weekly sessions of structured mindfulness-based stress reduction intervention for the mindfulness-based stress reduction group and one health education session for the treatment-as-usual group. Regular medical intervention and monthly consultations with the cardiologist were consistent for both groups. The main outcome measures were hospital anxiety and depression scale, perceived stress scale (perceived stress), blood pressure and body mass index. Independent sample 't' tests, chi square test and paired sample 't' test were used. All patients completed intervention in the mindfulness-based stress reduction group. Significant reduction was observed in symptoms of anxiety and depression, perceived stress, blood pressure and body mass index in patients of the mindfulness-based stress reduction group after the completion of intervention assessment. At three-month follow-up, therapeutic gains were maintained in patients of the mindfulness-based stress reduction group. The mindfulness-based stress reduction program is effective in reducing symptoms of anxiety and depression, perceived stress, blood pressure and body mass index in patients with chronic heart disease.

Gawinski, Kali (2012) investigated a study "The effects of type of yoga training on physiological and psychological fitness in college aged men and women". For this purpose ten males and twenty one females aged from 19 to 33 years were randomized to either an eight week trial of Hatha yoga performed under normal temperatures (fifteen subjects) or hot yoga (sixteen subjects). All participants attended

80 minute yoga classes at a local studio, three times per week. Several physiological and psychological outcomes were evaluated at baseline, at four weeks, and at the end of trial. Variables including body mass index, body composition, systolic and diastolic blood pressure, flexibility, peak oxygen consumption, Beck Depression Inventory, and State Trait Anxiety Inventory were studied. Participants' heart rates and temperatures were monitored during weekly yoga classes to assess cardiovascular intensity of yoga as exercise. Hot yoga participants worked at a significantly higher cardiovascular intensity. Further, participants in the hot yoga group spent more time at greater than 60%, 70% and 80% of their maximum heart rate throughout the exercise period. For all training groups, improvements were seen in body composition and flexibility, but there were no differences between groups. Further, mean systolic blood pressure decreased by 5.8 ±12.5 mmHg after 4 weeks of yoga training and remained reduced at the end of 8 weeks. The result shows that there was a significant improvement in trait anxiety levels and depression scores. These observations suggest that there are no additional psychological or physiological benefits gained by hot yoga training, but more importantly, there are several health benefits of engaging in regular yoga practice.

Ross, Alyson et al. (2012) investigated a study on "Frequency of Yoga Practice Predicts Health: Results of a National Survey of Yoga Practitioners". The purpose of the study was to examine the relationship between yoga practice and health (subjective well-being, diet, body mass index, smoking, alcohol/caffeine consumption, sleep, fatigue, social support, mindfulness, and physical activity). Four thousand three hundred and seven (4307) subjects were randomly selected from 18,160 samples at 15 United States Iyengar Yoga Studios. Frequency of home practice favorably predicted: mindfulness, subjective well-being, body mass index,

fruit and vegetable consumption, vegetarian status, sleep, and fatigue. Each component of yoga practice (different categories of physical poses, breath work, meditation, philosophy study) predicted at least one health outcome. It was concluded that the Home practice of yoga predicted health better than years of practice or class frequency.

Shim, CS. and Lee, YS. (2012) conducted a study on "Effects of a yoga - focused prenatal program on stress, anxiety, self confidence and labor pain in pregnant women with in vitro fertilization treatment." For this purpose forty six women who were pregnant following in vitro fertilization, and were between 12 to 20 weeks of gestation, participated in the study. They were divided into experimental group and control group. A quasi experimental study with a non-equivalent control group pretest-posttest design was used. The collected data were analyzed using Chi-square test, Mann-Whitney U Test, analysis of covariance, and Cronbach's alpha coefficients. Although the sample size was limited, women who participated in the program showed statistically significant improvements in stress, anxiety, labor pain, and labor confidence for women pregnant after in vitro fertilization. It was concluded that the result indicates 12-week Yoga-focused educational program can be utilized for women pregnant following in vitro fertilization to reduce their stress, anxiety, and labor pain, and to increase delivery confidence.

Li, AW. and Goldsmith, CA. (2012) conducted a study on "The effects of yoga on anxiety and stress." The focus of this review is on the results of human trials assessing the role of yoga in improving the signs and symptoms of stress and anxiety. Of 35 trials addressing the effects of yoga on anxiety and stress, 25 noted a significant decrease in stress and/or anxiety symptoms when a yoga regimen was implemented; however, many of the studies were also hindered by limitations, such as small study

populations, lack of randomization, and lack of a control group. Fourteen of the 35 studies reported biochemical and physiological markers of stress and anxiety, but yielded inconsistent support of yoga for relief of stress and anxiety. Evaluation of the current primary literature is suggestive of benefits of yoga in relieving stress and anxiety, but further investigation into this relationship using large, well-defined populations, adequate controls, randomization and long duration should be explored before recommending yoga as a treatment option.

Mehrotra, Ranjita et al. (2012) conducted a study on "Effect of yoga on anxiety score and resting heart rate in young healthy individuals." Study group included subjects who participated in yoga practices for a period of three months. Control group included subjects who did not perform yoga or any exercise. Anxiety score and resting heart rate were recorded in both the groups before start of study and at end of the study. Anxiety score was estimated with the help of Taylor's manifest anxiety scale questionnaire and resting heart rate was estimated by using electrocardiogram. The Collected data was analyzed using Mann Whitney test and paired 't' test. At the end of three months statistically significant decrease in anxiety score and resting heart rate was observed in the study group. Whereas, there was no statistically significant difference in anxiety score and resting heart rate of control group. It was concluded that yoga practices of even short duration can reduce anxiety status and decrease resting heart rate.

Telles, Shirley. et al. (2012) conducted a study on "Effect of Yoga on different aspects of Mental Health." State anxiety, somatization of stress, quality of life, self-rated quality of sleep, and discomfort due to over-breathing which occurs when stressed were studied. Out of a total of 140 participants, seventy participants self-selected to be in a yoga group for stress relief. Seventy age and gender matched

participants were in a control group. Assessments were made at the beginning and end of the week. Repeated measures analysis of variance with Bonferroni adjusted post-hoc analyses showed a significant decrease in state anxiety, somatization of stress, improved health-related quality of life, self-rated quality of sleep, and decrease in discomfort due to over-breathing. No changes (except decreased discomfort due to over-breathing) occurred in the control group. This study suggests that a brief yoga program may be beneficial in decreasing anxiety, somatization of stress and discomfort, improving health-related quality of life and self-rated sleep quality.

Hegde, SV. et al. (2011) conducted a study on "Effect of 3-month yoga on oxidative stress in type 2 diabetes with or without complications: a controlled clinical trial". For this purpose 123 patients were selected as subjects and they were stratified according to groups with micro-vascular complications, macro-vascular complications, and peripheral neuropathy and without complications and assigned to receive either standard care or standard care along with additional yoga for three months. In comparison with standard care alone, yoga resulted in significant reduction in body mass index, glycemic control, and malondialdehyde and increase in glutathione and vitamin C. The results proved that 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. It was concluded that Yoga can be used as an effective therapy in reducing oxidative stress in type 2 diabetes and Yoga in addition to standard care helps reduce body mass index and improve glycemic control in type 2 diabetic patients.

Dubey, SN. (2011) investigated a study on "Impact of yogic practices on some psychological variables among adolescents" For the purpose of the study a group of 30 boys and 20 girls aged between 16 to 18 years were selected as subjects and

similar in educational standard and economic status were tested on seven psychological variables, such as self-concept, aggressive reactions to frustration, tolerance, ahimsa, truth fullness, faith and fidelity. The group was then divided in two having, equal number of boys and girls of similar characteristics on these variables. One group (Experimental) was given yogic practices of Asanas, Pranayam and yogic Jogging for 15 days daily for one and a half hours in the morning while the other group (control) was set free to adopt their original life style. At the end of fifteenth day both the groups were tested on seven psychological variables. It was found that the subjects of experimental group receiving yogic practices have significantly high scores on self-concept, tolerance, ahimsa, truthfulness, faith and fidelity but low on extragression and ego defence and high on obstacle- dominance, need persistence and introgression of aggressive reactions to frustration as compared to their scores on these variables before start of the yogic practices. There was no significant change in scores of control group of subjects on these variables.

Smith, JA. et al. (2011) conducted a study on "Is there more to yoga than exercise?." Aim of the study is to compare the physical and mental benefits of an exercise-based yoga practice to that of a more comprehensive yoga practice (one with an ethical/spiritual component). Students with mild to moderate depression, anxiety, or stress and who agreed to participate were assigned to one of three groups: integrated yoga, yoga as exercise, control. A total of 81 undergraduate students 18 years and older at a university in the southeastern United States participated in the study. Main outcome measures of the study were depression, anxiety, stress, hope, and salivary cortisol. Over time participants in both the integrated and exercise yoga groups experienced decreased depression and stress, an increased sense of hopefulness, and increased flexibility compared to the control group. However, only

the integrated yoga group experienced decreased anxiety-related symptoms and decreased salivary cortisol from the beginning to the end of the study. Yoga, practiced in a more integrated form, that is, with an ethical and spiritual component, may provide additional benefits over yoga practiced as an exercise regimen.

Chong, CS. et al. (2011) conducted a study on "Effects of yoga on stress management in healthy adults: A systematic review." A systematic literature search was performed to identify randomized controlled trials and clinical controlled trials that assessed the effects of yoga on stress management in healthy adults. Selected studies were classified according to the types of intervention, duration, outcome measures, and results. They were also qualitatively assessed based on Public Health Research, Education and Development standards. The systematic review was based on eight randomized controlled trials and clinical controlled trials that indicated a positive effect of yoga in reducing stress levels or stress symptoms. However, most of the studies had methodological problems in that the intervention duration was short and limited follow - up data was available. This review revealed positive effects of yoga on stress reduction in healthy adult populations. However, the result should be interpreted with caution due to the small number of studies and the associated methodological problems. Further studies to ascertain yoga's long-term effects and the underlying biological mechanisms leading to its stress reduction effect should be conducted.

Ross, Alyson and Thomas, Sue (2010) investigated a study on "The Health Benefits of Yoga and Exercise: A Review of Comparison Studies" The purpose of the study is to provide a scholarly review of the literature regarding research studies comparing the effects of yoga and exercise on a variety of health outcomes and health conditions. Using PubMed® and the key word "yoga," a comprehensive search of the

research literature from core scientific and nursing journals yielded 81 studies that met inclusion criteria. These studies subsequently were classified as uncontrolled with 30 studies, wait list controlled with 16 studies, or comparison with 35 studies. The most common comparison intervention with ten studies involved exercise. These studies were included in this review. In the studies reviewed, yoga interventions appeared to be equal or superior to exercise in nearly every outcome measured except those involving physical fitness. The studies comparing the effects of yoga and exercise seem to indicate that, in both healthy and diseased populations, yoga may be as effective as or better than exercise at improving a variety of health-related outcome measures. Future clinical trials are needed to examine the distinctions between exercise and yoga, particularly how the two modalities may differ in their effects on the sympathetic nervous system to hypothalamic-pituitary-adrenal axis. Additional studies using rigorous methodologies are needed to examine the health benefits of the various types of yoga.

Kausthub, D. (2010) performed a study on the "Effect of individual yoga training on quality of life." For the purpose of the study 149 samples were selected as subjects. Their age ranged from 18 to 60 years. An 87 samples formed experimental group, 62 formed the control group. All the subjects were tested on the quality of life questionnaire, developed by the investigator. The intervention program used in this study involved individual yoga therapy classes, which were designed specifically for the care seeker. They were given personal practice that they had to follow each day at home. The duration of the training program was six months. Pre, mid and post test were taken for all the subjects. The collected data were analyzed using 't' test and paired 't' test. The results showed that individualized yoga intervention is effective in enhancing physical quality of life and also it offered more scope for improving

satisfaction indices level on different aspects of life. Finally it was concluded that the role of yoga in enhancing the physical and mental well being of individuals.

Deshpande, S. et al. (2009) conducted a study on "A randomized control trial of the effect of yoga on Gunas (personality) and Self esteem in normal healthy volunteers." Of the 1228 persons who attended motivational lectures, 226 subjects aged 18 to 71 years, of both sexes, who satisfied the inclusion and exclusion criteria, and who consented to participate in the study were randomly allocated into two groups. The Yoga group practiced in an integrated yoga module that included asanas, pranayama, meditation, notional correction, and devotional sessions. The comparison group practiced mild to moderate physical exercises. Both groups had supervised practices for one hour daily, six days a week, for eight weeks. Guna (personality) was assessed before and after eight weeks using the self-administered "The 'Gita" Inventory of Personality" to assess Sattva, Rajas, and Tamas. Self esteem in terms of competency, global self esteem, moral and self esteem, social esteem, family self esteem, body and physical appearance, and the lie scale were assessed using the self esteem questionnaire. The baseline scores for all domains for both the groups did not differ significantly. There were significant pre-post improvements in all domains in both groups. The number of persons who showed improvement in Sattva and decrease in Tamas was significant in the yoga but not in the physical exercise group (McNemar test). The effect size for self esteem in the yoga group is greater than for the physical exercise group in three out of seven domains. This randomized controlled study has shown the influence of Yoga on Gunas and self esteem in comparison to physical exercise.

Sharma, R. et al. (2008) performed a study on "Effect of yoga based lifestyle intervention on subjective well-being." 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' 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 ten 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.

Deshpande, S. et al. (2008) conducted a study on "A randomized control trial of the effect of yoga on Gunas (personality) and Health in normal healthy volunteers." Of the 1228 persons who attended introductory lectures, 226 subjects aged 18-71 years, of both sexes, who satisfied the inclusion and exclusion criteria and who consented to participate in the study were randomly allocated into two groups. The Yoga group practiced in an integrated yoga module. The control group practiced mild to moderate physical exercises. Both groups had supervised practice sessions for one hour daily, six days a week for eight weeks. Guna was assessed before and after eight weeks using the self-administered vedic personality inventory which assesses Sattva, Rajas and Tamas. The general health status was assessed using a general health questionnaire. Baseline scores for all the domains for both the groups did not differ significantly. Sattva showed a significant difference within the groups and the effect size was more in the yoga than in the physical exercise group. Rajas showed a significant decrease within and between the groups with a higher effect size in the

physical exercise group. Tamas showed significant reduction within the physical exercise group only. The general health questionnaire revealed that there was significant decrease in somatic symptoms, anxiety and insomnia, social dysfunction and severe depression in both yoga and physical exercise groups. Somatic symptoms showed a significant difference between the groups (Mann Whitney U Test). There was an improvement in Sattva in both the Yoga and control groups with a trend of higher effect size in Yoga; Rajas reduced in both but significantly better in physical exercise than in Yoga and Tamas reduced in physical exercise. The general health status improved in both the Yoga and control groups.

Leung, YW. et al. (2008) conducted a study on "Gender differences in motivations and perceived effects of mind-body therapy practice and views on integrative cardiac rehabilitation among acute coronary syndrome patients: why do women use mind-body therapy?." Aim of the study is to qualitatively explore gender differences in the motivations for, and perceived effects of mind-body therapy, and the inter-relationships among alternative and conventional physical activities and secondary prevention programs. A random subsample of 16 participants (eight female) who reported practicing mind-body therapy in a larger study of 661 cardiac patients was interviewed until theme saturation was achieved. After main themes emerged, the data were split by gender to identify differences for each theme. Five themes emerged: (1) promotes positive well-being, (2) physical health benefits, (3) intrinsic and extrinsic motivations, (4) proactive health orientation, and (5) mind-body therapy as a preferred complementary and/or alternative physical activity. Men more often expressed preference for mind-body therapy for increased positive mood and cardiac-specific benefits, whereas women emphasized stress reduction, increasing self-efficacy, and physical activity, and were eager to see mind-body therapy offered

in cardiac rehabilitation. Both male and female users perceived substantial psychosocial and physical benefits of mind-body therapy practice. Mind-body therapy addresses some of women's common barriers to cardiac rehabilitation.

Smith, C. et al. (2007) carried out a study on "A randomised comparative trial of yoga and relaxation to reduce stress and anxiety." Aim of the study is to compare yoga and relaxation as treatment modalities at ten and sixteen weeks from study baseline to determine if either of modality reduces subject's stress, anxiety, blood pressure and improve quality of life. A randomised 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. Intervention of the study was ten weekly one-hour sessions of relaxation or hatha yoga. Main outcome measures were changes in the state trait personality inventory sub-scale anxiety, general health questionnaire and the short form-36. Following the ten week intervention, stress, anxiety and quality of life scores improved over time. Yoga was found to be as effective as relaxation in reducing stress, anxiety and improving health status on seven domains of the short form-36. Yoga was more effective than relaxation in improving mental health. At the end of the six week follow-up period, there were no differences between groups in levels of stress, anxiety and on five domains of the short form-36. Vitality, social function and mental health scores on the short form-36 were higher in the relaxation group during the follow-up period. Yoga appears to provide a comparable improvement in stress, anxiety and health status compared to relaxation.

Bridges, K. and Madlem, M. (2007) carried out a study on "Yoga, Physical Education, and Self-Esteem: Off the court and Onto the mat for mental health." Researchers studied increases in self-esteem of eighth-grade students after

participation in regular physical education and yoga-enhanced physical education classes. The Coopersmith Self-esteem Inventory was given pre, mid, and post test in both the experimental and control group. The results showed that over the course of the eight-week intervention, self-esteem did increase in both the experimental and control groups. There was no significant difference in self-esteem between regular physical education activities and yoga. The study revealed the importance of physical activity, including yoga, for enhancing self-esteem.

Carlson, LE. et al. (2007) conducted a study on "One year pre-post intervention follow-up of psychological, immune, endocrine and blood pressure outcomes of mindfulness-based stress reduction in breast and prostate cancer outpatients." Forty-nine patients with breast cancer and ten with prostate cancer enrolled in an eight-week mindfulness-based stress reduction program that incorporated relaxation, meditation, gentle yoga and daily home practice. Demographic and health behaviors, quality of life, mood, stress symptoms, salivary cortisol levels, immune cell counts, intracellular cytokine production, blood pressure and heart rate were assessed pre- intervention and post-intervention, and at six and twelve-month follow-up. Linear mixed modeling showed significant improvements in overall symptoms of stress which were maintained over the follow-up period. Cortisol levels decreased systematically over the course of the follow-up. Immune patterns over the year supported a continued reduction in Th1 (pro-inflammatory) cytokines. Systolic blood pressure decreased from pre- intervention to post-intervention and heart rate was positively associated with self-reported symptoms of stress. Mindfulness-based stress reduction program participation was associated with enhanced quality of life and decreased stress symptoms, altered cortisol and immune patterns consistent with less stress and mood disturbance, and decreased blood

pressure. These pilot data represent a preliminary investigation of the longer-term relationships between mindfulness-based stress reduction program participation and a range of potentially important biomarkers.

2.4 SUMMARY OF THE LITERATURE

The investigator has collected all the reviews related to yogic practices on selected physiological, hematological and psychological variables from the libraries of Tamil Nadu Physical Education and Sports University, Madras University, Anna centenary library and from the internet to provide sufficient knowledge to the readers and for the effective analysis of the present study.

The reviews are presented under the three sections namely studies on yoga with physiological variables (n=23), hematological variables (n=27), psychological variables (n=22). All the research studies that are presented in this section prove that yogic practices contribute significantly for better improvement in all the criterion variables.

Research studies using yogic practices revealed compatible results from Telles, Shirley., et al. (2013); Bhavanani AB., et al. (2012); Lakkireddy D., et al. (2013); Tundwala et al. (2012); Rani, M., et al. (2013); Deshpande, S. et al.(2009); Smith, JA., et al. (2011); Li, AW., and Goldsmith, CA. (2012). There was clear evidence that the use of yogic practices were one of the effective training methods to improve the selected criterion variables on hypothyroid women.

The review of literature helped the researcher from the methodological point of view too. Based on the experience gained, the investigator formulated suitable methodology to be adopted in this research, which is presented in chapter-III.