CHAPTER II

REVIEW OF RELATED LITERATURE

A Study of relevant literature is an essential step to get a comprehension of what has to been done with regard to the problem under any study. The purpose of the study was to find out the effect of varied packages of yogic practices on selected motor ability, physiological, hematological and bio-chemical variables. The investigator went through several journals, books, magazines, articles and collected necessary and relevant materials for this study are presented in this chapter. The reviews of the literature have been classified under the following headings:

- Studies on motor abilities.
- Studies on physiological variables.
- Studies on hematological variables.
- Studies on bio-chemical variables
- Summary of the literature.

2.1 STUDIES ON MOTOR ABILITY VARIABLES

Chen T.L. et al. (2009), done a research on “The Effect of Yoga Exercise Intervention on Health Related Physical Fitness in School-Age Asthmatic Children”. The study contains the following. The purpose of this study was to investigate the effect of yoga exercise on the health-related physical fitness of school-age children with asthma. The study employed a quasi-experimental research design in which 31 voluntary children (exercise group 16; control group 15) aged 7 to 12 years were purposively sampled from one public elementary school in Taipei County. The yoga exercise program was practiced by the exercise group three times per week for a consecutive 7 week period. Each 60-minute yoga session included 10 minutes of warm-up and breathing exercises, 40 minutes of yoga postures, and 10 minutes of cool down exercises. Fitness scores were assessed at pre-exercise (baseline) and at the seventh and ninth week after intervention completion. A total of 30 subjects (exercise group 16; control group 14) completed follow-up. Results included: 1. Compared with children in the general population, the study subjects
(n = 30) all fell below the 50th percentile in all five physical fitness items of interest. There was no significant difference in scores between the two groups at baseline (i.e., pre-exercise) for all five fitness items. 2. Research found a positive association between exercise habit after school and muscular strength and endurance among asthmatic children. 3. Compared to the control group, the exercise group showed favorable outcomes in terms of flexibility and muscular endurance. Such favorable outcomes remained evident even after adjusting for age, duration of disease and steroid use, values for which were unequally distributed between the two groups at baseline. 4. There was a tendency for all item-specific fitness scores to increase over time in the exercise group. The GEE analysis showed that yoga exercise indeed improved BMI, flexibility, and muscular endurance. After 2 weeks of self-practice at home, yoga exercise continued to improve BMI, flexibility, muscular strength, and cardiopulmonary fitness.

Rajakumar J (2010), done a research on “The Impact of Yogic Practices and Physical Exercises on Selected Physical Variables among Inter-Collegiate Soccer Players”. The study contains the following. The purpose of the study is to analyze the impact of yogic practices and physical exercises on selected physical variables among intercollegiate soccer players. To achieve this purpose, sixty (60) male intercollegiate soccer players from Chennai were selected at random. The selected subjects were divided into three equal groups of 20 each, namely yogic practice group (Group A), physical exercises group (Group B) and control group (Group C). The experimental groups have undergone 12 weeks of training. The control group (Group C) maintained their daily routine activities and no special training was given. The subjects of all the three groups were tested using standardized tests and procedures on the selected physical variables before and after the training period to find out the training effects using the following test items: 50 meters Run to measure speed, shuttle run to measure agility, sit and reach to measure flexibility. The yogic practice group showed significant improvement on flexibility. The physical exercises group showed significant improvement on speed, agility, then the other two groups after 12 weeks of training. Key words: Physical variables, Experimental groups, Control group, Speed, Agility, Flexibility, 50 meters Run, Shuttle run, Sit and reach test.
Tran M.D. et al. (2001), done a research on “Effects of Hatha Yoga Practice on the Health-Related Aspects of Physical Fitness”. The study contains the following. Ten healthy, untrained volunteers (nine females and one male), ranging in age from 18-27 years, were studied to determine the effects of hatha yoga practice on the health-related aspects of physical fitness, including muscular strength and endurance, flexibility, cardiorespiratory fitness, body composition, and pulmonary function. Subjects were required to attend a minimum of two yoga classes per week for a total of 8 weeks. Each yoga session consisted of 10 minutes of pranayamas (breath-control exercises), 15 minutes of dynamic warm-up exercises, 50 minutes of asanas (yoga postures), and 10 minutes of supine relaxation in savasana (corpse pose). The subjects were evaluated before and after the 8-week training program. Isokinetic muscular strength for elbow extension, elbow flexion, and knee extension increased by 31%, 19%, and 28% (p<0.05), respectively, whereas isometric muscular endurance for knee flexion increased 57% (p<0.01). Ankle flexibility, shoulder elevation, trunk extension, and trunk flexion increased by 13% (p<0.01), 155% (p<0.001), 188% (p<0.001), and 14% (p<0.05), respectively. Absolute and relative maximal oxygen uptake increased by 7% and 6%, respectively (p<0.01). These findings indicate that regular hatha yoga practice can elicit improvements in the health-related aspects of physical fitness. (c) 2001 CHF, Inc.

Madanmohan, Mahadevan S.K. et al. (2008), done a research on “Effect of Six Weeks Yoga Training on Weight Loss Following Step Test, Respiratory Pressures, Handgrip Strength and Handgrip Endurance in Young Healthy Subjects”. The study contains the following. The present study was designed to test whether yoga training of six weeks duration modulates sweating response to dynamic exercise and improves respiratory pressures, handgrip strength and handgrip endurance. Out of 46 healthy subjects (30 males and 16 females, aged 17-20 year), 23 motivated subjects (15 male and 8 female) were given yoga training and the remaining 23 subjects served as controls. Weight loss following Harvard step test (an index of sweat loss), maximum inspiratory pressure, maximum expiratory pressure, 40 mm endurance, handgrip strength and handgrip endurance were determined before and after the six week study period. In the yoga group, weight loss in response to Harvard step test was 64 +/- 30 g after yoga training as compared to 161 +/- 133 g before the training and the difference was
significant (n = 15 male subjects, P < 0.0001). In contrast, weight loss following step test was not significantly different in the control group at the end of the study period. Yoga training produced a marked increase in respiratory pressures and endurance in 40 mm Hg test in both male and female subjects (P < 0.05 for all comparisons). In conclusion, the present study demonstrates attenuation of the sweating response to step test by yoga training. Further, yoga training for a short period of six weeks can produce significant improvements in respiratory muscle strength and endurance.


**Objectives:** Exercise is considered an acceptable method for improving and maintaining physical and emotional health. A growing body of evidence supports the belief that yoga benefits physical and mental health via down-regulation of the hypothalamic-pituitary-adrenal (HPA) axis and the sympathetic nervous system (SNS). The purpose of this article 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. **Methods:** Using PubMed ((R)) 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 (n = 30), wait list controlled (n = 16), or comparison (n = 35). The most common comparison intervention (n = 10) involved exercise. These studies were included in this review. **Results:** In the studies reviewed, yoga interventions appeared to be equal or superior to exercise in nearly every outcome measured except those involving physical fitness. **Conclusions:** 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 SNS/HPA axis. Additional studies using rigorous methodologies are needed to examine the health benefits of the various types of yoga.
Clay C.C. et al. (2005), done a research on “The Metabolic Cost of Hatha Yoga”. The study contains the following. To determine the metabolic and heart rate (HR) responses of hatha yoga, 26 women (19-40 years old) performed a 30-minute hatha yoga routine of supine lying, sitting, and standing asanas (i.e., postures). Subjects followed identical videotaped sequences of hatha yoga asanas. Mean physiological responses were compared to the physiological responses of resting in a chair and walking on a treadmill at 93.86 m.min(-1) [3.5 miles per hour (mph)]. During the 30-minute hatha yoga routine, mean absolute oxygen consumption (Vo(2)), relative Vo(2), percentage maximal oxygen consumption (%Vo(2)R), metabolic equivalents (METs), energy expenditure, HR, and percentage maximal heart rate (%MHR) were 0.45 L.min(-1), 7.59 ml.kg(-1).min(-1), 14.50%, 2.17 METs, 2.23 kcal.min(-1), 105.29 b.min(-1), and 56.89%, respectively. When compared to resting in a chair, hatha yoga required 114% greater O(2) (L.min(-1)), 111% greater O(2)(ml.kg(-1).min(-1)), 4,294% greater %Vo(2)R, 111% greater METs, 108% greater kcal.min(-1), 24% greater HR, and 24% greater %MHR. When compared to walking at 93.86 m.min(-1), hatha yoga required 54% lower O(2)(L.min(-1)), 53% lower O(2)(ml.kg(-1).min(-1)), 68% lower %Vo(2)R, 53% lower METs, 53% lower kcal.min(-1), 21% lower HR, and 21% lower %MHR. The hatha yoga routine in this study required 14.50% Vo2 R, which can be considered a very light intensity and significantly lighter than 44.8% Vo2) R, for walking at 93.86 m.min (-1) (3.5 mph). The intensity of hatha yoga may be too low to provide a training stimulus for improving cardiovascular fitness. Although previous research suggests that hatha yoga is an acceptable form of physical activity for enhancing muscular fitness and flexibility, these data demonstrate that hatha yoga may have little, if any, cardiovascular benefit.

Hagins M, Moore W, and Rundle A (2007), did a research on “Does practicing hatha yoga satisfy recommendations for intensity of physical activity which improves and maintains health and cardiovascular fitness”. The study contains the following. Background: Little is known about the metabolic and heart rate responses to a typical hatha yoga session. The purposes of this study were 1) to determine whether a typical yoga practice using various postures meets the current recommendations for levels of physical activity required to improve and maintain health and cardiovascular fitness; 2) to determine the reliability of metabolic costs of yoga across sessions; 3) to compare the
metabolic costs of yoga practice to those of treadmill walking. Methods: In this observational study, 20 intermediate-to-advanced level yoga practitioners, age 31.4 +/- 8.3 years, performed an exercise routine inside a human respiratory chamber (indirect calorimeter) while wearing heart rate monitors. The exercise routine consisted of 30 minutes of sitting, 56 minutes of beginner-level hatha yoga administered by video, and 10 minutes of treadmill walking at 3.2 and 4.8 kph each. Measures were mean oxygen consumption (VO2), heart rate (HR), percentage predicted maximal heart rate (%MHR), metabolic equivalents (METs), and energy expenditure (kcal). Seven subjects repeated the protocol so that measurement reliability could be established. Results: Mean values across the entire yoga session for VO2, HR, %MHR, METs, and energy/min were 0.6 L/kg/min; 93.2 beats/min; 49.4%; 2.5; and 3.2 kcal/min; respectively. Results of the ICCs (2,1) for mean values across the entire yoga session for kcal, METs, and %MHR were 0.979 and 0.973, and 0.865, respectively. Conclusion: Metabolic costs of yoga averaged across the entire session represent low levels of physical activity, are similar to walking on a treadmill at 3.2 kph, and do not meet recommendations for levels of physical activity for improving or maintaining health or cardiovascular fitness. Yoga practice incorporating sun salutation postures exceeding the minimum bout of 10 minutes may contribute some portion of sufficiently intense physical activity to improve cardiorespiratory fitness in unfit or sedentary individuals. The measurement of energy expenditure across yoga sessions is highly reliable.

Sinha B. et al. (2004), done a research on “Energy Cost and Cardiorespiratory Changes during the Practice of Surya Namaskar”. The study contains the following. Surya Namaskar (SN), a group of Yogic exercise consists of a set of twelve postures which is practiced by some of the yoga practitioners. The present study was undertaken to observe critically the energy cost and different cardiorespiratory changes during the practice of SN. Twenty-one male volunteers from the Indian Army practiced selected Yogic exercises for six days in a week for three months duration. The Yogic practice schedule consisted of Hatha Yogic Asanas (28 min), Pranayama (10.5 min) and Meditation (5 min). In the Yogic practice schedule 1st they practiced Kapala Bhati (breathing maneuvers) for 2 min then Yoga mudra (yogic postural exercise) for 2 min, after that they took rest until oxygen consumption and heart rate (HR) came to resting
value. Subsequently subjects performed SN for 3 min 40 seconds on an average. After three months of training at the beginning of the fourth month subjects performed entire Yogic practice schedule in the laboratory as they practiced during their training session and experiments were carried out. Their pulmonary ventilation, carbon dioxide output, Oxygen consumption, HR and other cardiorespiratory parameters were measured during the actual practice of SN. Oxygen consumption was highest in the eighth posture (1.22+/-.073 1 min (-1)) and lowest in the first posture (0.35+/-.02 1 min (-1)). Total energy cost throughout the practice of SN was 13.91 kcal and at an average of 3.79 kcal/min. During its practice highest HR was 101+/-.13.5 bpm. As an aerobic exercise SN seemed to be ideal as it involves both static stretching and slow dynamic component of exercise with optimal stress on the cardiorespiratory system.

**Danucalov M.A. et al. (2008)**, done a research on “Cardiorespiratory and Metabolic Changes during Yoga Sessions: The Effects of Respiratory Exercises and Meditation Practices”. The study contains the following. The novelty of this study was to investigate the changes in cardiorespiratory and metabolic intensity brought about by the practice of pranayama’s (breathing exercises of yoga) and meditation during the same hatha-yoga session. The technique applied was the one advocated by the hatha-yoga system. Nine yoga instructors-five females and four males, mean age of 44+/-.11, 6, were subjected to analysis of the gases expired during three distinct periods of 30 min: rest, respiratory exercises and meditative practice. A metabolic open circuit computerized system was applied (VO2000, Med Graphics-USA). The oxygen uptake (VO (2)) and the carbon dioxide output (VCO (2)) were statistically different (P <or= 0.05) during meditation and pranayama practices when compared with rest. The heart rate also suffered relevant reductions when results at rest were compared with those during meditation. A smaller proportion of lipids were metabolized during meditation practice compared with rest. The results suggest that the meditation used in this study reduces the metabolic rate whereas the specific pranayama technique in this study increases it when compared with the rest state.
Hayes M and Chase S. (2010), done a research on “Prescribing Yoga”. The study contains the following. More than 15.8 million people in the United States now practice some form of yoga, and nearly half of current practitioners stated they began yoga practice as a means of improving overall health. More broadly understood in a modern context, yoga is a set of principles and practices designed to promote health and well-being through the integration of body, breath, and mind. This article outlines the history of yoga and describes several forms, including asana-based yoga, which is becoming popular in the United States. Research findings related to use of yoga as a therapy for various health problems are reviewed. Guidelines for finding a yoga teacher are offered, as are a number of book and Internet sources of further information.

Rathore B.S. et al. (2009), done a research on “Critical Analysis of Cardiovascular and Motor Fitness Abilities of Inter-University Players”. The study contains the following. The purpose of this study was to examine cardiovascular and motor fitness profile (abilities) of inter-university players of University of Rajasthan. An insignificant difference between individual game and team game players (t value of .06 was less than the table value of 1.96 required for 't' test to be significant at 0.05 level with 118 degree of freedom) was observed in cardiovascular endurance, explosive strength, muscular strength and endurance of arms and shoulders, agility and total J.C.R. scores. Key Words: Cardiovascular profile, motor fitness, individual game players and team game players.

Chen K.M. et al. (2010), done a research on “Silver Yoga Exercises Improved Physical Fitness of Transitional Frail Elders”. The study contains the following. Background: Promoting the health of transitional frail elders (e.g., through therapeutic-based yoga exercises) is essential to reduce healthcare expenditures caused by chronic health problems. Objective: The purpose of this study was to determine the efficacy of 24 weeks of the senior-tailored silver yoga (SY) exercise program for transitional frail elders. Methods: A convenience sample of 69 elders in assisted living facilities were assigned randomly to the SY group (n = 38) or to the control group (n = 31) on the basis of the facilities where they resided, and 55 of them completed this quasi-experimental pretest and posttest study. Intervention was conducted three times per week, 70 minutes
per session, for 24 weeks. Physical fitness (body composition, cardiovascular-respiratory functions, body flexibility, muscle power and endurance, balance, and agility) were examined at baseline, at 12 weeks, and at the end of the 24th week of the study. Results: At the end of the study, the physical fitness indicators of participants in the SY group had improved significantly, and they had better physical fitness than participants in the control group (all p values < .05). Discussion: It was recommended that the SY exercises be incorporated as an activity program in assisted living facilities to promote the physical fitness of transitional frail elders.

**Madanmohan, Udupa K. et al. (2005)**, done a research on “Effect of Slow and Fast Pranayams on Reaction Time and Cardiorespiratory Variables”. The study contains the following. We planned to undertake a comparative study of the effect of short term (three weeks) training in savitri (slow breathing) and bhasrika (fast breathing) pranayams on respiratory pressures and endurance, reaction time, blood pressure, heart rate, rate-pressure product and double product. Thirty student volunteers were divided into two groups of fifteen each. Group I was given training in savitri pranayam that involves slow, rhythmic, and deep breathing. Group II was given training in bhasrika pranayam, which is bellows-type rapid and deep breathing. Parameters were measured before and after three week training period. Savitri pranayam produced a significant increase in respiratory pressures and respiratory endurance. In both the groups, there was an appreciable but statistically insignificant shortening of reaction time. Heart rate, rate-pressure product and double product decreased in savitri pranayam group but increased significantly in bhasrika group. It is concluded that different types of pranayams produce different physiological responses in normal young volunteers.

**Udupa K. et al. (2003)**, done a research on “Effect of Pranayam Training on Cardiac Function in Normal Young Volunteers’. The study contains the following. Systolic time intervals (STI) are non-invasive and sensitive tests for measuring the ventricular performance. It has been reported that practice of pranayam modulates cardiac autonomic status and improves cardio-respiratory functions. Keeping this in view, the present study was designed to determine whether pranayam training has any effect on ventricular performance as measured by STI and cardiac autonomic function tests (AFT).
Twenty four school children were randomly divided into two groups of twelve each. Group I (pranayam group) subjects were given training in nadishuddhi, mukh-bastrika, pranav and savitri pranayams and practiced the same for 20 minutes daily for a duration of 3 months. Group II (control group) subjects were not given any pranayam training. STI (QS2, LVET and PEP) and AFT (RRIV and QT/QS2) were measured in both the groups at the beginning and again at the end of three months study period. Pranayam training produced an increase in RRIV and a decrease in QT/QS2, suggesting an enhanced parasympathetic and blunted sympathetic activity respectively. QS2, PEP and PEP/LVET increased significantly, whereas LVET was reduced significantly in pranayam group. In contrast, the changes in STI and AFT were much less marked in the control group. Our study shows that three months of pranayam training modulates ventricular performance by increasing parasympathetic activity and decreasing sympathetic activity. Further studies on a larger sample size may illustrate the underlying mechanism(s) involved in this alteration.

Madanmohan, Thombre D.P. et al. (1992), done a research on “Effect of Yoga Training on Reaction Time, Respiratory Endurance and Muscle Strength”. The study contains the following. There is evidence that the practice of yoga improves physical and mental performance. The present investigation was undertaken to study the effect of yoga training on visual and auditory reaction times (RTs), maximum expiratory pressure (MEP), maximum inspiratory pressure (MIP), 40 mmHg test, breath holding time after expiration (BHT.exp), breath holding time after inspiration (BHT.insp), and hand grip strength (HGS). Twenty seven student volunteers were given yoga training for 12 weeks. There was a significant (P < 0.001) decrease in visual RT (from 270.0 +/- 6.20 (SE) to 224.81 +/- 5.76 ms) as well as auditory RT (from 194.18 +/- 6.00 to 157.33 +/- 4.85 ms). MEP increased from 92.61 +/- 9.04 to 126.46 +/- 10.75 mmHg, while MIP increased from 72.23 +/- 6.45 to 90.92 +/- 6.03 mmHg, both these changes being statistically significant (P < 0.05). 40 mmHg test and HGS increased significantly (P < 0.001) from 36.57 +/- 2.04 to 53.36 +/- 3.95 s and 13.78 +/- 0.58 to 16.67 +/- 0.49 kg respectively. BHT.exp increased from 32.15 +/- 1.41 to 44.53 +/- 3.78s (P < 0.01) and BHT.insp increased from 63.69 +/- 5.38 to 89.07 +/- 9.61 s (P < 0.05). Our results show that yoga
practice for 12 weeks results in significant reduction in visual and auditory RTs and significant increase in respiratory pressures, breath holding times and HGS.

Pratima M. et al. (2008), done a research on “Effect of Suryanamaskar Practice on Cardio-respiratory Fitness Parameters: A Pilot Study”. The study contains the following. In recent times, medical fraternity is attracted towards yoga. Suryanamaskar is a part of yogic practices and is believed to be an all-round exercise. The present study tested efficacy of regular practice of ‘suryanamaskar’ in improving the cardio-respiratory fitness. The present study was conducted on 78 subjects, (48 males and 30 females). It was observed that 6 months of suryanamaskar practice decreases resting pulse rate and blood pressure. At the same time it increases cardio-respiratory efficiency and respiratory capacity as evaluated by bicycle ergometer and various lung functions tests, in both male and female subjects. From this study we conclude that suryanamaskar practice can be advocated to improve cardio-respiratory efficiency for patients as well as healthy individuals.

2.2 STUDIES ON PHYSIOLOGICAL VARIABLES

Ramesh V, Sakthignanavel D and Subramaniam P.K. (2010), in their paper made an attempt to test the effect of Yogasanas and pranayama on the selected physiological variables of school boy’s. The selected variables include systolic pressure, diastolic pressure, pulse rate and respiratory rate. To achieve this purpose of the study, thirty boys in the age group of 12 to 15 years were selected from Jawaharlal Navodaya Vidyalaya Higher Secondary School. The subjects were randomly selected and divided equally into two groups as control group and experimental group. The experimental groups were given yogasanas and pranayama training for a period of twelve weeks, both mornings and evenings on five days a week. The control group did not participate in yogasana and pranayama training programme. The collected data were statistically analyzed by using analysis of covariance (ANCOVA). The experimental group had a significant improvement on the selected physiological variables than the control group. This is the confirmation to our hypothesis. Key words: Systolic Pressure, Diastolic Pressure, Pulse Rate and Respiratory rate.
Kewal Krishan and Sudhir Kumar Sharma (2009), done a research on “Effects of Yogic Practices and Callisthenic Exercises on Resting Pulse Rate Variable of Secondary School Boys”. The study contains the following. The objective of this research was to study the effects of yogic practices and callisthenic exercises on resting pulse rate variables of secondary school boys in Hamirpur district of Uttar Pradesh Total 120 boys subjects (40 yogic practices group, 40 calisthenics exercises group and 40 control group) were put under yogic practices and calisthenics exercises group a pretest was taken for all the 120 subjects. Six weeks training of yogic practices and calisthenics exercises was given to the respective groups. A post test was taken after six weeks of the training. Analysis of variance was applied to compare the four groups, for their heart rate response pattern, and Scheffe’s post hoc test was applied to find out the superiority of the group. The result of the study indicated that Resting pulse rate of yogic practices group was better than the other two groups. Keyword: callisthenic & resting pulse rate.

Upadhyay Dhungel K. et al. (2008), done a research on “Effect of Alternate Nostril Breathing Exercise on Cardiorespiratory Functions”. The study contains the following. Pranayama (breathing exercise), one of the yogic techniques can produce different physiological responses in healthy individuals. The responses of Alternate Nostril Breathing (ANB) the Nadisudhi Pranayama on some cardio-respiratory functions were investigated in healthy young adults. The subjects performed ANB exercise (15 minutes every day in the morning) for four weeks. Cardio-respiratory parameters were recorded before and after 4-weeks training period. A significant increment in Peak expiratory flow rate (PEFR L/min) and Pulse pressure (PP) was noted. Although Systolic blood pressure (SBP) was decreased insignificantly, the decreases in pulse rate (PR), respiratory rate (RR), diastolic blood pressure (DBP) were significant. Results indicate that regular practice of ANB (Nadisudhi) increases parasympathetic activity.

Anurodh Singh Sisodia and Satendra Singh Tomar (2009), done a research on “Effect of Anuloma Viloma Pranayama on Selected Respiratory Variables”. The study contains the following. The study was conducted on selected respiratory variables on 30 male college students, 15 students in each group (experimental & control) with the purpose to investigate the effect of anuloma viloma pranayama on selected respiratory
variables. The selected respiratory variables were vital capacity, peak flow rate, positive breath holding time & negative breath holding time. To determine the effect of anuloma viloma pranayama on selected respiratory variables, analysis of covariance (ANCOVA) was employed at 0.05 level of significant. On the basis of results, the following conclusions were drawn: Significance improvements were found in relation to vital capacity (189.37), peak flow rate (13.44) & negative breath holding time (47.17). No significance effect was found on male students in relation to positive breath holding time (1.042). Keyword: Pranayama, Vital capacity & peak flow rate.

An H. et al. (2010), done a research on “Measures of Heart Rate Variability in Women Following a Meditation Technique”. The study contains the following. Certain time domain, frequency domain and a nonlinear measure of heart rate variability are studied in women following a meditative practice called cyclic meditation. The nonlinear measure studied is the sampling entropy. We show that there is an increase in the sampling entropy in the meditative group as compared to the control group. The time domain measure called PNNX is shown to be useful in distinguishing between the meditative state and a normal resting state

Penk C K. et al. (2004), done a research on “Heart Rate Dynamics during Three Forms of Meditation”. The study contains the following. Objective: This study was designed to quantify and compare the instantaneous heart rate dynamics and cardiopulmonary interactions during sequential performance of three meditation protocols with different breathing patterns. Background: We analyzed beat-to-beat heart rate and continuous breathing signals from 10 experienced meditators (4 females; 6 males; mean age 42 years; range 29-55 years) during three traditional interventions: relaxation response, breath of fire, and segmented breathing. Results: Heart rate and respiratory dynamics were generally similar during the relaxation response and segmented breathing. We observed high amplitude, low frequency (approximately 0.05-0.1 Hz) oscillations due to respiratory sinus arrhythmia during both the relaxation response and segmented breathing, along with a significantly (p<0.05) increased coherence between heart rate and breathing during these two maneuvers when compared to baseline. The third technique, breath of fire, was associated with a different pattern of
response, marked by a significant increase in mean heart rate with respect to baseline (p<0.01), and a significant decrease in coherence between heart rate and breathing (p<0.05). Conclusions: These findings suggest that different meditative/breathing protocols may evoke common heart rate effects, as well as specific responses. The results support the concept of a "meditation paradox," since a variety of relaxation and meditative techniques may produce active rather than quiescent cardiac dynamics, associated with prominent low frequency heart rate oscillations or increases in mean resting heart rate. These findings also underscore the need to critically assess traditional frequency domain heart rate variability parameters in making inferences about autonomic alterations during meditation with slow breathing.

Telles S, Reddy S.K. and Nagendra H.R. et al. (2000), done a research on “Oxygen Consumption and Respiration Following Two Yoga Relaxation Techniques”. The study contains the following. The present study was conducted to evaluate a statement in ancient yoga texts that suggests that a combination of both "calming" and "stimulating" measures may be especially helpful in reaching a state of mental equilibrium. Two yoga practices, one combining "calming and stimulating" measures (cyclic meditation) and the other, a "calming" technique (shavasan), were compared. The oxygen consumption, breath rate, and breath volume of 40 male volunteers (group mean +/- SD, 27.0 +/- 5.7 years) were assessed before and after sessions of cyclic meditation (CM) and before and after sessions of shavasan (SH). The 2 sessions (CM, SH) were 1 day apart. Cyclic meditation includes the practice of yoga postures interspersed with periods of supine relaxation. During SH the subject lies in a supine position throughout the practice. There was a significant decrease in the amount of oxygen consumed and in breath rate and an increase in breath volume after both types of sessions (2-factor ANOVA, paired t test). However, the magnitude of change on all 3 measures was greater after CM: (1) Oxygen consumption decreased 32.1% after CM compared with 10.1% after SH; (2) breath rate decreased 18.0% after CM and 15.2% after SH; and (3) breath volume increased 28.8% after CM and 15.9% after SH. These results support the idea that a combination of yoga postures interspersed with relaxation reduces arousal more than relaxation alone does.
Sodhi C., Singh S. and Dandona P.K. (2009), done a research on “A Study of the Effect of Yoga Training on Pulmonary Functions in Patients with Bronchial Asthma”. The study contains the following. The role of yoga breathing exercises, as an adjunct treatment for bronchial asthma is well recognized. One hundred twenty patients of asthma were randomized into two groups i.e., Group A (yoga training group) and Group B (control group). Each group included sixty patients. Pulmonary function tests were performed on all the patients at baseline, after 4 weeks and then after 8 weeks. Majority of the subjects in the two groups had mild disease (34 patients in Group A and 32 in Group B). Group A subjects showed a statistically significant increasing trend (P < 0.01) in % predicted peak expiratory flow rate (PEFR), forced expiratory volume in the first second (FEV1), forced vital capacity (FVC), forced mid expiratory flow in 0.25-0.75 seconds (FEF25-75) and FEV1/FVC% ratio at 4 weeks and 8 weeks as compared to Group B. Thus, yoga breathing exercises used adjunctively with standard pharmacological treatment significantly improves pulmonary functions in patients with bronchial asthma.

Raghuraj P, Telles S. (2008), done a research on “Immediate Effect of Specific Nostril Manipulating Yoga Breathing Practices on Autonomic and Respiratory Variables”. The study contains the following. The effect of right, left, and alternate nostril yoga breathing (i.e., RNYB, LNYB, and ANYB, respectively) were compared with breath awareness (BAW) and normal breathing (CTL). Autonomic and respiratory variables were studied in 21 male volunteers with ages between 18 and 45 years and experience in the yoga breathing practices between 3 and 48 months. Subjects were assessed in five experimental sessions on five separate days. The sessions were in fixed possible sequences and subjects were assigned to a sequence randomly. Each session was for 40 min; 30 min for the breathing practice, preceded and followed by 5 min of quiet sitting. Assessments included heart rate variability, skin conductance, finger plethysmogram amplitude, breath rate, and blood pressure. Following RNYB there was a significant increase in systolic, diastolic and mean pressure. In contrast, the systolic and diastolic pressure decreased after ANYB and the systolic and mean pressure were lower after LNYB. Hence, unilateral nostril yoga breathing practices appear to influence the blood pressure in different ways. These effects suggest possible therapeutic applications.
Ray U.S. et al. (2001), done a research on “Aerobic Capacity & Perceived Exertion after Practice of Hatha Yogic Exercises”. The study contains the following. Background & Objectives: Reports on the effect of yogic exercises on aerobic capacity are few. There is also no literature available on the effect of yogic exercise on perceived exertion (PE) after maximal exercise. In this study the effect of training in Hatha yogic exercises on aerobic capacity and PE after maximal exercise was observed. Methods: Forty men from the Indian army (aged 19-23 years) were administered maximal exercise on a bicycle ergometer in a graded work load protocol. The oxygen consumption, carbon dioxide output, pulmonary ventilation, respiratory rate, heart rate (HR) etc., at maximal exercise and PE score immediately thereafter were recorded. The subjects were divided into two equal groups. Twelve subjects dropped out during the course of study. One group (yoga, n = 17) practiced Hatha yogic exercises for 1 h every morning (6 days in a week) for six months. The other group (PT, n = 11) underwent conventional physical exercise training during the same period. Both groups participated daily in different games for 1 h in the afternoon. In the 7th month, tests for maximal oxygen consumption (VO2Max) and PE were repeated on both groups of subjects. Results: Absolute value of VO2Max increased significantly (P < 0.05) in the yoga group after 6 months of training. The PE scores after maximal exercise decreased significantly (P < 0.001) in the yoga group after 6 months but the PT group showed no change. Interpretation & conclusion: The practice of Hatha yogic exercises along with games helps to improve aerobic capacity like the practice of conventional exercises (PT) along with games. The yoga group performed better than the PT group in terms of lower PE after exhaustive exercise.

Prasad K.V. et al. (1997), done a research on “Influence of Intensive Yoga Training on Physiological Changes in 6 Adult Women: A Case Report”. The study contains the following. The short-term effects of 4 weeks of intensive yoga practice on physiological responses in six healthy adult female volunteers were measured using the maximal exercise treadmill test. Yoga practice involved daily morning and evening sessions of 90 minutes each. Pre- and post-yoga exercise performance was compared. Maximal work output (Wmax) for the group increased by 21%, with a significantly reduced level of oxygen consumption per unit work but without a concomitant significant change in heart rate. After intensive yoga training, at 154 W min(-1) (corresponding to
Wmax of the pre-yoga maximal exercise test) participants could exercise more comfortably, with a significantly lower heart rate (p < 0.05), reduced minute ventilation (p < 0.05), reduced oxygen consumption per unit work (p < 0.05), and a significantly lower respiratory quotient (p < 0.05). The implications for the effect of intensive yoga on cardiorespiratory efficiency are discussed, with the suggestion that yoga has some transparently different quantifiable physiological effects to other exercises.

**Blumenthal J.A. et al. (1989),** done a research on “Cardiovascular and Behavioral Effects of Aerobic Exercise Training in Healthy Older Men and Women”. The study contains the following. The cardiovascular and behavioral adaptations associated with a 4-month program of aerobic exercise training were examined in 101 older men and women (mean age = 67 years). Subjects were randomly assigned to an Aerobic Exercise group, Yoga and Flexibility control group, or a Waiting List control group. Prior to and following the 4-month program, subjects underwent comprehensive physiological and psychological evaluations. Physiological measures included measurement of blood pressure, lipids, bone density, and cardiorespiratory fitness including direct measurements of peak oxygen consumption (VO₂) and anaerobic threshold. Psychological measures included measures of mood, psychiatric symptoms, and neuropsychological functioning. This study demonstrated that 4 months of aerobic exercise training produced an overall 11.6% improvement in peak VO₂ and a 13% increase in anaerobic threshold. In contrast, the Yoga and Waiting List control groups experienced no change in cardiorespiratory fitness. Other favorable physiological changes observed among aerobic exercise participants included lower cholesterol levels, diastolic blood pressure levels, and for subjects at risk for bone fracture, a trend toward an increase in bone mineral content. Although few significant psychological changes could be attributed to aerobic exercise training, participants in the two active treatment groups perceived themselves as improving on a number of psychological and behavioral dimensions.

**Pomidori L et al. (2009),** done a research on “Efficacy and Tolerability of Yoga Breathing in Patients with Chronic Obstructive Pulmonary Disease: A Pilot Study”. The study contains the following. Purpose: Yoga-derived breathing has been reported to
improve gas exchange in patients with chronic heart failure and in participants exposed to high-altitude hypoxia. We investigated the tolerability and effect of yoga breathing on ventilatory pattern and oxygenation in patients with chronic obstructive pulmonary disease (COPD). Methods: Patients with COPD (N = 11, 3 women) without previous yoga practice and taking only short-acting beta2-adrenergic blocking drugs were enrolled. Ventilatory pattern and oxygen saturation were monitored by means of inductive plethysmography during 30-minute spontaneous breathing at rest (sb) and during a 30-minute yoga lesson (y). During the yoga lesson, the patients were requested to mobilize in sequence the diaphragm, lower chest, and upper chest adopting a slower and deeper breathing. We evaluated oxygen saturation (SaO2%), tidal volume (VT), minute ventilation (E), respiratory rate (i>f), inspiratory time, total breath time, fractional inspiratory time, an index of thoracic abdominal coordination, and an index of rapid shallow breathing. Changes in dyspnea during the yoga lesson were assessed with the Borg scale. Results: During the yoga lesson, data showed the adoption of a deeper and slower breathing pattern (VTsb L 0.54[0.04], VTy L 0.74[0.08], P = .01; i>fsb 20.8[1.3], i>fy 13.8[0.2], P = .001) and a significant improvement in SaO2% with no change in E (SaO2%sb 91.5 %[1.13], SaO2%y 93.5%[0.99], P = .02; Esb L/min 11.2[1.1], Ey L/min 10.2[0.9]). All the participants reported to be comfortable during the yoga lesson, with no increase in dyspnea index. Conclusion: We conclude that short-term training in yoga is well tolerated and induces favorable respiratory changes in patients with COPD.

Danucalov M.A. et al. (2008), done a research on “Cardiorespiratory and Metabolic Changes during Yoga Sessions: The Effects of Respiratory Exercises and Meditation Practices”. The study contains the following. The novelty of this study was to investigate the changes in cardiorespiratory and metabolic intensity brought about by the practice of pranayamas (breathing exercises of yoga) and meditation during the same hatha-yoga session. The technique applied was the one advocated by the hatha-yoga system. Nine yoga instructors-five females and four males, mean age of 44+/1-11, 6, were subjected to analysis of the gases expired during three distinct periods of 30 min: rest, respiratory exercises and meditative practice. A metabolic open circuit computerized system was applied (VO2000, Med Graphics-USA). The oxygen uptake (VO2) and the carbon dioxide output (VCO2) were statistically different (P <or= 0.05) during
meditation and pranayama practices when compared with rest. The heart rate also suffered relevant reductions when results at rest were compared with those during meditation. A smaller proportion of lipids were metabolized during meditation practice compared with rest. The results suggest that the meditation used in this study reduces the metabolic rate whereas the specific pranayama technique in this study increases it when compared with the rest state.

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

Kasundra P.M., Thumar, P.B. and Mungra J.D. (2010), quoted the objective of the study was to assess the impact of Pranayama training on selected components of blood. It was hypothesized that there would be no significant effect of Pranayama training on selected components of blood. For the present study subject selected were students of Bachelor of Arts studying in Mahadev Desai Gram Seva Mahavidyalaya. Randomly 30 students were selected for the study and then subjects was divided into two equal groups randomly consisting of 15 subjects each belonging to one experimental (Group A) and one control group (Group B). Group A were exposed to Pranayama and group B was control group. Experimental group participated in Pranayama training for eight weeks. The variables and test items selected for the present study were cholesterol, blood glucose, hemoglobin, WBC, RBC, platelets. For analyzing the data t-test was used to find out the significant difference between pre-test and post-test. This study revealed significant difference in pre-test and post-test of experimental groups of selected blood components i.e. cholesterol, blood glucose, hemoglobin, WBC, RBC, platelets. This shows that Pranayama training has an impact on selected components of blood.

Yoga P, Abirami Kiruthiga S and Elangovan R (2011), quoted the purpose of the present investigation is to find out the Effect of Suryanamaskar and Physical Exercises on Selected Hematological Variables among College Women Students. To achieve these purpose 90 women students were selected from A. K. D. Dharmaraja Women’s College, Rajapalayam, Tamil Nadu as subjects. Their age ranged from 18 to 25 years. They were divided into three equal groups of 30 subjects each and assigned to experimental group-I, experimental group-II and control group. In a week the experimental group I underwent Suryanamaskar Practice, experimental group II underwent Physical Exercises and Control Group was not given any specific training. All the subjects underwent three areas of test namely RBC Count (Red Blood Cell Count), WBC Count (White Blood Cell Count) and Hemoglobin. They assessed before and after the training period of six weeks. The analysis of covariance was used to analyze the data. The study revealed that the above said criterion variables were significantly improved due to the influence of Suryanamaskar and Physical Exercises on Selected Hematological
Variables among College Women Students. Key words: Suryanamaskar, Physical Exercises, RBC Count, WBC Count, Hemoglobin, ANCOVA.

**Bernardi L. et al. (2007),** done a research on “Reduced Hypoxic Ventilatory Response with Preserved Blood Oxygenation in Yoga Trainees and Himalayan Buddhist Monks at Altitude: Evidence of a Different Adaptive Strategy”. The study contains the following. Yoga induces long-term changes in respiratory function and control. We tested whether it represents a successful strategy for high-altitude adaptation. We compared ventilatory, cardiovascular and hematological parameters in: 12 Caucasian yoga trainees and 12 control sea-level residents, at baseline and after 2-week exposure to high altitude (Pyramid Laboratory, Nepal, 5,050 m), 38 active lifestyle high-altitude natives (Sherpa’s) and 13 contemplative lifestyle high-altitude natives with practice of yoga-like respiratory exercises (Buddhist monks) studied at 5,050 m. At baseline, hypoxic ventilatory response (HVR), red blood cell count and hematocrit were lower in Caucasian yoga trainees than in controls. After 14 days at altitude, yoga trainees showed similar oxygen saturation, blood pressure, RR interval compared to controls, but lower HVR (-0.44 +/- 0.08 vs. -0.98 +/- 0.21 l/min/m/% Sa O(2), P < 0.05), minute ventilation (8.3 +/- 0.9 vs. 10.8 +/- 1.6 l/min, P < 0.05), breathing rate (indicating higher ventilatory efficiency), and lower red blood cell count, hemoglobin, hematocrit, albumin, erythropoietin and soluble transferrin receptors. Hypoxic ventilatory response in monks was lower than in Sherpa’s (-0.23 +/- 0.05 vs. -0.63 +/- 0.09 l/min/m/% Sa O(2), P < 0.05); values were similar to baseline data of yoga trainees and Caucasian controls, respectively. Red blood cell count and hematocrit were lower in monks as compared to Sherpa’s. In conclusion, Caucasian subjects practicing yoga maintain a satisfactory oxygen transport at high altitude, with minimal increase in ventilation and with reduced hematological changes, resembling Himalayan natives. Respiratory adaptations induced by the practice of yoga may represent an efficient strategy to cope with altitude-induced hypoxia.

**Talukdar B, Verma S, Jain S. C. and Majumdar M. (1996),** done a research on “Effect of Yoga Training on Plasma Lipid Profile, R.B.C. Membrane Lipid Peroxidation and Na+K+ ATPase Activity in Patients of Essential Hypertension”. The study contains the following. We conducted a controlled study on effect of selected yoga practice in the
control and management of 50 cases of essential hypertension and equal number of healthy (no hypertensive) controls. Free radical cellular damage is considered to be the underlying common biological factor in essential hypertension. We, therefore, investigated lipid profile lipid peroxidation and Na\(^+\)K\(^+\) ATPase activities of plasma membrane of subjects with essential hypertension. It was found that hypertensive subjects had an elevated lipid peroxidation and decreased Na\(^+\)K\(^+\) ATPase activity in plasma membrane as compared to normotensive healthy controls, the specific yoga training protocol which was administered not only helped to decrease blood pressure but also retard the progression of cellular damage due to free radicals.

**Chohan I.S. et al. (1984),** Yoga is known to induce beneficial effects on physiological, biochemical and mental functions in man. Its effects on blood coagulation are not known. A study was conducted in seven previously untrained male adults who underwent a combination of yogic exercises, daily for one hour, over a period of four months. Parameters of blood coagulation were estimated before and after the end of yoga training. The following changes were observed: Fibrinolytic activity increased significantly with a concomitant fall in fibrinogen; activated partial thromboplastin time and platelet aggregation time were prolonged; blood and plasma platelets showed a rise; and both hemoglobin and hematocrit were raised at the end of the training. These findings suggest that yoga induces a state of blood hypercoagulability. The impact of yoga on prevention of cardiovascular and thrombotic disorders is obvious.

**Colwell J.A. (1986),** Studied the Effects of exercise on platelet function, coagulation, and fibrinolysis Exercise and physical conditioning may reduce the subsequent risk of major vascular thrombotic events. In view of this, it may be important to examine the effects of exercise on the blood coagulation system. The present paper reviews the effects of physical exercise and conditioning on blood coagulation, platelet function, and fibrinolytic activity. A hypothetical scheme is developed, in which increased blood coagulability and activated platelet function is counterbalanced by increased fibrinolytic activity and endothelial prostacyclin release. Some consideration is given to how this sequence of events may be altered in vascular disease states.
Wang J.S. (2006), Exercise Prescription and Thrombogenesis Lifestyle habits, such as exercise, may significantly influence risk of major vascular thrombotic events. The risk of primary cardiac arrest has been shown to transiently increase during vigorous exercise, whereas regular moderate-intensity exercise is associated with an overall reduced risk of cardiovascular diseases. What are the mechanisms underlying these paradoxical effects of vigorous exercise versus exercise training on thrombotic modification? This review analyzes research regarding effects and their underlying mechanisms of acute exercise, endurance training, and deconditioning on platelets, coagulation, and fibrinolysis. Evidence suggests that (i) light, acute exercise (≤ 49% VO\(_2\) max) does not affect platelet reactivity and coagulation and increases fibrinolytic activity; (ii) moderate, acute exercise (50 to approximately 74% VO\(_2\) max) suppresses platelet reactivity and enhances fibrinolysis, which remains unchanged in the coagulation system; and, (iii) strenuous, acute exercise (> or = 75% VO\(_2\) max) enhances both platelet reactivity and coagulation, simultaneously promoting fibrinolytic activity. Therefore, moderate exercise is likely a safe and effective exercise dosage for minimizing risk of cardiovascular diseases by inducing beneficial anti-thrombotic changes. Moreover, moderate-intensity exercise training reduces platelet reactivity and enhances fibrinolysis at rest, also attenuating enhanced platelet reactivity and augmenting hyper-fibrinolytic activity during strenuous exercise. However, these favorable effects of exercise training on thrombotic modification return to a pre-training state after a period of deconditioning. These findings can aid in determining appropriate exercise regimes to prevent early thrombotic events and further hinder the cardiovascular disease progression.

Ubatuba F.B, Harvey E.A. and Ferreira S.H. (1975), done a research on “Are platelets important in inflammation”. The study contains the following. The participation of platelets in acute inflammation was tested by three different traumas in rats rendered thrombocytopenic with anti-platelet serum. Thrombocytopenic rats showed normal edema response to carrageenan, anti-platelet serum and passive cutaneous anaphylaxis.
Vij, D. et al. (1984), done a research on “The Importance of the WBC Count in Peritoneal Lavage”. The study contains the following. A subset of ten consecutive patients who had sustained penetrating and blunt abdominal trauma came to the hospital with stable vital signs. None had any clinical evidence of intra peritoneal injury. All patients underwent peritoneal lavage, and surgical exploration was performed on the basis of a 100,000/cu mm in the effluent. Substantial intra peritoneal injury was found in nine of ten patients. We suggest that as a further refinement of peritoneal lavage, in addition to RBC count, the WBC count be measured in the effluent fluid and if it is found to be greater than 500/cu mm, surgical exploration is carried out.

Grimm RH Jr, Neaton JD, Ludwig W (1985), did a research on “Prognostic Importance of the White Blood Cell Count for Coronary, Cancer, and All-Cause Mortality”. The study contains the following. The relationship of white blood cell count (WBC) to fatal and nonfatal coronary heart disease (CHD) incidence and all-cause and cancer mortality was assessed in a subset of participants in the Multiple Risk Factor Intervention Trial (MRFIT). For this group of 6,222 middle aged men, total WBC count was found to be strongly and significantly related to risk of CHD, independent of smoking status. Change in WBC count from baseline to the annual examination just prior to the CHD event was found to be a significant and independent predictor of CHD risk. For each decrease in WBC count of 1,000/cu mm the risk for CHD death decreased 14%, controlling for baseline WBC count and other CHD risk factors (smoking, cholesterol level, diastolic blood pressure). The WBC count was strongly related cross-sectional to cigarette smoking and smoking status as indicated by serum thiocyanate concentration. Smokers on average had a WBC count of 7,750/cu mm compared with 6,080/cu mm for nonsmokers. The WBC count was also significantly associated with cancer death, independent of reported smoking and serum thiocyanate levels.

Ikarugi H. et al. (1999), done a research on “Norepinephrine, but not Epinephrine, Enhances Platelet Reactivity and Coagulation after Exercise in Humans”. The study contains the following. The effects of exercise and catecholamine’s on platelet reactivity or coagulation and fibrinolysis appear to be inconsistent. This may be partly due to the methods employed in previous studies. In the present study, we investigated
the effects of acute aerobic exercise and catecholamine’s on the thrombotic status by a novel in vitro method, shear-induced hemostatic plug formation (hemostatometry), using nonanticoagulated (native) blood. Aerobic exercise (60% maximal O2 consumption) was performed by healthy male volunteers for 20 min, and the effect on platelet reactivity and coagulation was assessed by performing hemostatometry before and immediately after exercise. Exercise significantly increased shear-induced platelet reactivity, coagulation, and catecholamine levels. The effect of catecholamine’s on platelet reactivity and coagulation was assessed in vitro by adding catecholamine’s to blood collected in the resting state. The main findings of the present study are that elevation of circulating norepinephrine at levels that are attained during exercise causes platelet hyper reactivity and a platelet-mediated enhanced coagulation. This may be a mechanism of an association of aerobic exercise with thrombotic risk.

Jr Grimm RH, Neaton JD, Ludwig W (1985), studied the relationship of white blood cell count (WBC) to fatal and nonfatal coronary heart disease (CHD) incidence and all-cause and cancer mortality was assessed in a subset of participants in the Multiple Risk Factor Intervention Trial (MRFIT). For this group of 6,222 middle aged men, total WBC count was found to be strongly and significantly related to risk of CHD, independent of smoking status. Change in WBC count from baseline to the annual examination just prior to the CHD event was found to be a significant and independent predictor of CHD risk. For each decrease in WBC count of 1,000/cu mm the risk for CHD death decreased 14%, controlling for baseline WBC count and other CHD risk factors (smoking, cholesterol level, diastolic blood pressure). The WBC count was strongly related cross-sectional to cigarette smoking and smoking status as indicated by serum thiocyanate concentration. Smokers on average had a WBC count of 7,750/cu mm compared with 6,080/cu mm for nonsmokers. The WBC count was also significantly associated with cancer death, independent of reported smoking and serum thiocyanate levels.

Merhi Y et al. (1997), done a research on “Importance of Platelets in Neutrophil Adhesion and Vasoconstriction after Deep Carotid Arterial Injury by Angioplasty in Pigs”. The study contains the following. In previous studies we have shown that platelets
can support neutrophil adhesion to the injured vessel wall in vitro and that neutrophils contribute to vascular tone regulation after arterial injury in vivo. In this study, we investigated the implication of platelets in neutrophil adhesion and the vasomotor response to arterial injury in vivo. 111In-labeled neutrophil adhesion and angiographic vasoconstriction were quantified after deep carotid arterial injury by balloon angioplasty in normal (n = 8), thrombocytopenic (n = 7), and aspirin-treated (2 mg/kg IV, n = 7) pigs. Thrombocytopenia was produced by a polyclonal antiplatelet serum that depleted circulating platelet count by 84% without influencing neutrophil count. In the control animals, neutrophil adhesion (x 10^4/cm^2) at the site of deep arterial injury averaged 26.8 +/- 4.0 and decreased significantly to 11.5 +/- 2.3 and 11.2 +/- 2.4 in the thrombocytopenic and aspirin groups, respectively. The degree of vasoconstriction was also reduced significantly, from 55.5 +/- 3.8% in the control group to 31.4 +/- 6.2% after platelet depletion and to 23.6 +/- 4.5% in the aspirin-treated group. Neutrophil adhesion to intact non injured adjacent arterial segments was low in all groups and was not affected by the antiplatelet serum or by aspirin. In in vitro super fusion flow chambers, neutrophil adhesion to damaged arterial segments increased in the presence of platelets in a concentration-dependent manner and was not influenced by the antiplatelet serum. This study demonstrates that platelets can modulate neutrophil adhesion to the deeply injured arterial wall and that both elements may influence the degree of post angioplasty vasoconstriction in vivo.

Samraj et al. (2009), the present investigation is proposed to illuminate the changeability in selected Hematological parameters in response to moderate altitude exposure for his purpose, fifteen men handball player in the age group of 20 to 25 years. Were selected as subjects form Annamalai University, during their completive season the selected dependent variables such as Red Blood Cells, Hemoglobin, Hematocrit and platelets were appraised using procedures and instruments of scientific standards at acute exposure to moderate altitude with that of the sea level, ‘t’ test was used. The analysis of data revealed that there is a significant amplification o RBC, HB and HCT, Where’s, there was a dwindling effect on platelet count in response to moderate altitude exposure, since the obtained ‘t’ ratio of 13.28,91.12,7.68 and 9.00 respectively, were greater than the required table value. Exposure to moderate altitude had an affirmative impact of
10.14 %, 85 and 60335 on RBC, HB, and HCT respectively. There was a gloomy impact of 13.715 on platelets. These results suggest that acute exposure to moderate altitude induces in hematological parameters and thus requires abundant period for acclimatization.

2.4 STUDIES ON BIO-CHEMICAL VARIABLES

Yogaraj P, Ramaraj P and Elangovan R. (2010), The purpose of the present investigation is to find out the Effect of Selected Yogic Practices Physical Exercises on Bio-Chemical Variables among College Women Students. The study was conducted on 20 women students of Queen Mary’s College, Chennai, Tamil Nadu were selected as subjects. The selected as subjects were divided in two groups. Group I underwent the yogic practices training and Group II underwent the Physical exercises. The subject age ranged from 18 to 23 years. The subjects were selected at random from the College Women Students. The study was formulated as pre post and pre experimental design. The yogic practice group had significant improvement in body cholesterol and improved triglyceride, HDL and LDL. Key words: Yogic practices, Physical Exercises, Cholesterol, High Density.

Saravanan, J. et al. (2010), done a research on “Effect of Yogasana and Pranayama Exercises on Selected Biochemical and Physiological Variables”. The study contains the following. Sixty male students studied B.P.Ed. In the Department of Physical Education and Sports Sciences, Annamalai University was selected randomly as subjects and their age ranged between 25-28 years. They were divided in to four groups of fifteen each. Group I served as a control; Group II as Asana; Group III Pranayama and Group IV Yogasana (Asana and Pranayama). Yogasana practices were given to all the selected subjects except the control for three months (4 days/week). Biochemical and physiological variables were analyzed before and after the treatment moderates the lipid levels and blood pressure then other groups. The study also reveals that combined work of Asana and Pranayama significantly improves HDL concentration and decreases blood Pressure, cholesterol, triglycerides and LDL level. Key words: Asana, Pranayama, HDL
(High density lipoprotein), LDL (low density lipoprotein), VLDL (Very low density lipoprotein), Blood pressure.

**Selvalakshmi S and Yogaraj P (2009),** Quoted the purpose of the study was to find out the Effect of Varied yogic Practices on Hemoglobin and Blood sugar among obese Women. For the purpose of the study 45 obese women, were divided into three groups based on their BMI, one as Asanas and Pranayama group, second group as Asanas and Meditation group, third group served as control group. The selected subjects were measured of their Hemoglobin and Blood sugar. The interventional training programmes for this study were six weeks. Analysis of covariance (ANCOVA) was used to find out whether the mean differences were significant or not. The results of this study proved that there was a significant improvement on Hemoglobin and Blood sugar due to Asana, Pranayama and Meditation.

**Yogaraj P, Ramaraj P and Elangovan R. (2010),** The study was designed to investigate the “Effects of selected asanas on serum cholesterol and functions of adrenal gland in college women” To achieve this purpose 20 college women students were randomly selected from Queen Mary’s College, Chennai, Tamilnadu as subjects. They were divided into two groups. In a week the Experimental Group-I underwent Asana practice and Control Group was not given any specific training. Serum Cholesterol and Functions of Adrenal Gland were chosen as criterion variables. All the dependent variables were assessing before and after the training period of 8 weeks. Analysis of covariance was used to find out the adjusted post test mean difference among the treatment group. The study revealed that the Serum Cholesterol and Functions of Adrenal Gland were significantly improved due to influence of selected Asana practice. Key words: 1. Asana, 2. Serum Cholesterol, 3. Adrenal gland, 4. Analysis of covariance.

**Gordon, L.A. et al. (2008),** done a research on “Effect of Exercise Therapy on Lipid Profile and Oxidative Stress Indicators in Patients with Type 2 Diabetes”. The study contains the following. Background: Yoga has been shown to be a simple and economical therapeutic modality that may be considered as a beneficial adjuvant for type 2 diabetes mellitus. This study investigated the impact of Hatha yoga and conventional
physical training (PT) exercise regimens on biochemical, oxidative stress indicators and oxidant status in patients with type 2 diabetes. Methods: This prospective randomized study consisted of 77 type 2 diabetic patients in the Hatha yoga exercise group that were matched with a similar number of type 2 diabetic patients in the conventional PT exercise and control groups. Biochemical parameters such as fasting blood glucose (FBG), serum total cholesterol (TC), triglycerides, low-density lipoprotein (LDL), very low-density lipoproteins (VLDL) and high-density lipoprotein (HDL) were determined at baseline and at two consecutive three monthly intervals. The oxidative stress indicators (malondialdehyde - MDA, protein oxidation - POX, phospholipase A2 - PLA2 activity) and oxidative status [superoxide dismutase (SOD) and catalase activities] were measured.

Results: The concentrations of FBG in the Hatha yoga and conventional PT exercise groups after six months decreased by 29.48% and 27.43% respectively (P < 0.0001) and there was a significant reduction in serum TC in both groups (P < 0.0001). The concentrations of VLDL in the managed groups after six months differed significantly from baseline values (P = 0.036). Lipid peroxidation as indicated by MDA significantly decreased by 19.9% and 18.1% in the Hatha yoga and conventional PT exercise groups respectively (P < 0.0001); whilst the activity of SOD significantly increased by 24.08% and 20.18% respectively (P = 0.031). There was no significant difference in the baseline and 6 months activities of PLA2 and catalase after six months although the latter increased by 13.68% and 13.19% in the Hatha yoga and conventional PT exercise groups respectively (P = 0.144).

Conclusion: The study demonstrate the efficacy of Hatha yoga exercise on fasting blood glucose, lipid profile, oxidative stress markers and antioxidant status in patients with type 2 diabetes and suggest that Hatha yoga exercise and conventional PT exercise may have therapeutic preventative and protective effects on diabetes mellitus by decreasing oxidative stress and improving antioxidant status.

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

Results: Daily caloric intake (~1,916 kcal/day), program adherence (~85%), and exercising skills (asana performance) were similar in both middle-aged and older women. The IHY program did not modify any anthropometric measurements. However, it increased VO (2max) and VE (max) and HDL-C while TAG and LDL-C remained stable in both middle-aged and older groups (P < 0.01). Conclusions: The proposed IHY program improves different cardiovascular risk factors (namely VO (2max) and HDL-C) in middle-aged and older women.

Blumenthal James, A. et al. (1991), done a research on “Effects of Exercise Training on Cardiorespiratory Function in Men and Women >60 Years of Age” The study contains the following. This study reports the physiologic effects of up to 14 months of aerobic exercise in 101 older (>60 years) men and women. After an extensive baseline physiologic assessment (Time 1), in which aerobic capacity and blood lipids were measured, subjects were randomized to an aerobic exercise condition (cycle ergometer, 3 times per week for 1 hour), nonaerobic yoga (2 times per week for 1 hour), or a waiting list non exercise control group for 4 months, and then underwent a second (Time 2) assessment. At the completion of the second assessment, all remaining subjects completed 4 months of aerobic exercise and were reevaluated (Time 3). Subjects were given the option of participating in 6 additional months of supervised aerobic exercise, and all available subjects completed a fourth assessment (Time 4) 14 months after their initial baseline evaluation. Results indicated that subjects generally exhibited a 10 to 15%
improvement in peak oxygen consumption after 4 months of aerobic exercise training, and a 1 to 6% improvement in aerobic power with additional aerobic exercise training. On the other hand, subjects, especially men, continued to have improvements in submaximal exercise performance (i.e., anaerobic threshold). In addition, aerobic exercise was associated with an improved lipid profile; subjects participating in aerobic exercise for up to 14 months exhibited increased levels of high-density lipoprotein cholesterol. Maintenance of regular aerobic exercise for an extended time interval is associated with greater cardiovascular benefits among older adults than has been reported previously.

Malhotra V. et al. (2002), done a research on “Effect of Yoga Asanas on Nerve Conduction in Type 2 Diabetes”. The study contains the following. Twenty Type 2 diabetic subjects between the age group of 30-60 years were studied to see the effect of 40 days of Yoga asanas on the nerve conduction velocity. The duration of diabetes ranged from 0-10 years. Subject suffering from cardiac, renal and proliferative retinal complications were excluded from the study Yoga asanas included Suryanamaskar, Tadasana, Konasan, Padmasan Pranayama, Paschimottanasana, Ardhamatsyendrasan, Shavasan, Pavanmukthasan, Sarpasan and Shavasan. Subjects were called to the cardio-respiratory laboratory in the morning time and were given training by the Yoga expert. The Yoga exercises were performed for 30-40 minutes every day for 40 days in the above sequence. The subjects were prescribed certain medicines and diet. The basal blood glucose, nerve conduction velocity of the median nerve was measured and repeated after 40 days of Yogic regime. Another group of 20 Type 2 diabetes subjects of comparable age and severity, called the control group, were kept on prescribed medication and light physical exercises like walking. Their basal & post 40 day’s parameters were recorded for comparison. Right hand and left hand median nerve conduction velocity increased from 52.81 +/- 1.1 m/sec to 53.87 +/- 1.1 m/sec and 52.46 +/- 1.0 to 54.75 +/- 1/1 m/sec respectively. Control group nerve function parameters deteriorated over the period of study, indicating that diabetes is a slowly progressive disease involving the nerves. Yoga asanas have a beneficial effect on glycemic control and improve nerve function in mild to moderate Type 2 diabetes with sub-clinical neuropathy.
**Bijlani RL. et al. (2005),** done a research on “A Brief but Comprehensive Lifestyle Education Program Based on Yoga Reduces Risk Factors for Cardiovascular Disease and Diabetes Mellitus”. The study contains the following. Objectives: The objective of the study was to study the short-term impact of a brief lifestyle intervention based on yoga on some of the biochemical indicators of risk for cardiovascular disease and diabetes mellitus. Design: The variables of interest were measured at the beginning (day 1) and end (day 10) of the intervention using a pre-post design. Setting: The study is the result of operational research carried out in our Integral Health Clinic (IHC). The IHC is an outpatient facility which conducts 8-day lifestyle modification programs based on yoga for prevention and management of chronic disease. A new course begins every alternate week of the year. Subjects: The study is based on data collected on 98 subjects (67 male, 31 female), ages 20-74 years, who attended one of our programs. The subjects were a heterogeneous group of patients with hypertension, coronary artery disease, diabetes mellitus, and a variety of other illnesses. Intervention: The intervention consisted of asanas (postures), pranayama (breathing exercises), relaxation techniques, group support, individualized advice, lectures and films on the philosophy of yoga and the place of yoga in daily life, meditation, stress management, nutrition, and knowledge about the illness. Outcome Measures: 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. Results: Fasting plasma glucose, serum total cholesterol, low-density lipoprotein (LDL) cholesterol, very- LDL cholesterol, the ratio of total cholesterol to high density lipoprotein (HDL) cholesterol, and total triglycerides were significantly lower, and HDL cholesterol significantly higher, on the last day of the course compared to the first day of the course. The changes were more marked in subjects with hyperglycemia or hypercholesterolemia. Conclusions: The observations suggest that a short lifestyle modification and stress management education program leads to favorable metabolic effects within a period of 9 days.

**Yadav R.K. et al. (2005),** done a research on “Effect of a Comprehensive Yoga-Based Lifestyle Modification Program on Lipid Peroxidation”. The study contains the following. Oxidative stress contributes to the process of aging as well as a variety of chronic degenerative diseases. There are indications that psychological stress increases
oxidative stress whereas relaxation decreases it. We have measured the concentration of thiobarbituric acid reactive substances (TBARS) in blood as an indicator of oxidative stress at the beginning and at the end of a comprehensive yoga-based lifestyle modification program (YLMP). The data was collected from 104 subjects (59 male, 45 female), 19-71 years of age (mean +/- SD, 41.2 +/- 14.6 years). The YLMP consisted of a nine-day educational out-patient course on the theory and practice of yoga and included, besides a daily one-hour practice of physical postures (asanas) and breathing exercises (pranayama), lecture and films on yoga, stress management and nutrition, practice of meditation and shavasana (a relaxation technique), and individual counseling. Venous blood samples were collected on the first and last day of the course. The serum concentration of TBARS decreased significantly from 1.72 +/- 0.72 nmoles/ml on day 1 to 1.57 +/- 0.72 nmoles/ml on day 10 (P<0.05). The study suggests that a brief low cost lifestyle intervention based on yoga reduces oxidative stress.

Yang K (2007), done a research on “A Review of Yoga Programs for Four Leading Risk Factors of Chronic Diseases”. The study contains the following. Yoga, a form of physical activity, is rapidly gaining in popularity and has many health benefits. Yet healthcare providers have been slow to recognize yoga for its ability to improve health conditions, and few interventions have been developed that take full advantage of its benefits. The purpose of this article is to review published studies using yoga programs and to determine the effect of yoga interventions on common risk factors of chronic diseases (overweight, hypertension, high glucose level and high cholesterol). A systematic search yielded 32 articles published between 1980 and April 2007. The studies found that yoga interventions are generally effective in reducing body weight, blood pressure, glucose level and high cholesterol, but only a few studies examined long-term adherence. Additionally, not enough studies included diverse populations at high risk for diabetes and its related common health problems.

Telles S et al. (2010), studied the effects of yoga and diet change program, emphasizing breathing techniques practiced while seated, was assessed in obese persons. The methodology of the study was a single group of 47 persons were assessed on the first and last day of a yoga and diet change program, with 6 days of the intervention between
assessments. The assessments were: body mass index (BMI), waist and hip circumferences, mid-arm circumference, body composition, hand grip strength, postural stability, serum lipid profile and fasting serum leptin levels. Participants practiced yoga for 5 hours every day and had a low fat, high fiber, vegetarian diet. Last and first day data were compared using a t-test for paired data. The results of the study were the 6-day residential program, participants showed a decrease in BMI (1.6 percent), waist and hip circumferences, fat-free mass, total cholesterol (7.7 percent decrease), high density lipoprotein (HDL) cholesterol (8.7 percent decrease), fasting serum leptin levels (44.2 percent decrease) and an increase in postural stability and hand grip strength (p<0.05, all comparisons). The conclusion of the study was 6-day yoga and diet change program decreased the BMI and the fat-free mass. Total cholesterol also decreased due to reduced HDL levels. They suggested that, intensive yoga program with a change in diet can pose certain risks. Benefits seen were better postural stability, grip strength reduced waist and hip circumferences and a decrease in serum leptin levels.

**Mahajan A.S. et al. (1999),** studied the effect of yogic lifestyle on the lipid status in angina patients and normal subjects with risk factors of coronary artery disease. The parameters included the body weight, estimation of serum cholesterol, triglycerides, HDL, LDL and the cholesterol - HDL ratio. A baseline evaluation was done and then the angina patients and risk factors subjects were randomly assigned as control (n = 41) and intervention (yoga) group (n = 52). Lifestyle advice was given to both the groups. An integrated course of yoga training was given for four days followed by practice at home. Serial evaluation of both the groups was done at four, 10 and 14 weeks. Dyslipidemia was a constant feature in all cases. An inconsistent pattern of change was observed in the control group of angina (n = 18) and risk factor subjects (n = 23). The subjects practicing yoga showed a regular decrease in all lipid parameters except HDL. The effect started from four weeks and lasted for 14 weeks. The conclusion of the study was 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.

**Malhotra V, et al. (2005),** conducted the study of the beneficial effect of yoga in diabetes”, the subjects of the study was Twenty NIDDM subjects (mild to moderate
diabetics) in the age group of 30-60 years were selected from the outpatient clinic of G.T.B. hospital. They were on a 40 days yoga asana regime under the supervision of a yoga expert. 13 specific Yoga asanas ≤ done by Type 2 Diabetes Patients included. Surya Namaskar, Trikonasana, Tadasana, Sukhasana, Padmasana, Bhashrika Pranayama, Paschimottanasana, Ardha Matsyendrasana, Pawanmuktasana, Bhujangasana, Vajrasana, Dhanurasana and Shavasana are beneficial for diabetes mellitus. Serum insulin, plasma fasting and one hour postprandial blood glucose levels and anthropometric parameters were measured before and after yoga asanas. The results of the study indicated that there was significant decrease in fasting glucose levels from basal 208.3 +/- 20.0 to 171.7 +/- 19.5 mg/dl and one hour postprandial blood glucose levels decreased from 295.3 +/- 22.0 to 269.7 +/- 19.9 mg/dl. The exact mechanism as to how these postures and controlled breathing interact with somatic endocrine mechanism affecting insulin kinetics was worked out. A significant decrease in waist-hip ratio and changes in insulin levels were also observed, the suggestion of the study were a positive effect of yoga asanas on glucose utilization and fat redistribution in NIDDM. Yoga asanas may be used as an adjunct with diet and drugs in the management of Type 2 diabetes.

**Sharma SB, et al. (2002),** “conducted the study of yoga asanas in assessment of pulmonary function in NIDDM patients”. The subject of the study were twenty four NIDDM patients of 30 to 60 year old, provides metabolic and clinical evidence of improvement in glycemic control and pulmonary functions. These middle-aged subjects were type II diabetics on anti-hyper glycemic and dietary regimen. Their baseline fasting and postprandial blood glucose and glycosylated HB were monitored along with pulmonary function studies. The expert gave these patients training in yoga asanas and was pursed 30-40 min/day for 40 days under guidance. These asanas consisted of 13 well known postures, done in a sequence. After 40 days of yoga asanas regimen, the parameters were repeated. The results of the study there was significant decrease in fasting blood glucose levels. The postprandial blood glucose levels also decreased glycosylated hemoglobin showed a decrease. The FEV1, FVC, PEFR, MVV increased significantly. FEV1/FVC% improved. The suggestion of the study was better glycemic control and pulmonary functions can be obtained in NIDDM cases with yoga asanas and pranayama. The exact mechanism as to how these postures and controlled breathing
interact with somato-neuro-endocrine mechanism affecting metabolic and pulmonary functions remains to be worked out.

**Yurtkuran M. et al. (2007)**, done a research on “A Modified Yoga-Based Exercise Program in Hemodialysis Patients: A Randomized Controlled Study”. The study contains the following. Aim: To evaluate the effects of a yoga-based exercise program on pain, fatigue, sleep disturbance, and biochemical markers in hemodialysis patients. Materials and Methods: In 2004 a randomized controlled trial was carried out in the outpatient hemodialysis unit of the Nephrology Department, Uludag University Faculty of Medicine. Clinically stable hemodialysis patients (n=37) were included and followed in two groups: the modified yoga-based exercise group (n=19) and the control group (n=18). Yoga-based exercises were done in groups for 30 min/day twice a week for 3 months. All of the patients in the yoga and control groups were given an active range of motion exercises to do for 10 min at home. The main outcome measures were pain intensity (measured by the visual analogue scale, VAS), fatigue (VAS), sleep disturbance (VAS), and grip strength (mmHg); biochemical variables-- urea, creatine nine, calcium, alkaline phosphatase, phosphorus, cholesterol, HDL-cholesterol, triglyceride, erythrocyte, hematocrit--were evaluated. Results: After a 12-week intervention, significant improvements were seen in the variables: pain -37%, fatigue -55%, sleep disturbance -25%, grip strength +15%, urea -29%, creatine nine -14%, alkaline phosphatase -15%, cholesterol -15%, erythrocyte +11%, and hematocrit count +13%; no side-effects were seen. Improvement of the variables in the yoga-based exercise program was found to be superior to that in the control group for all the variables except calcium, phosphorus, HDL-cholesterol and triglyceride levels. Conclusion: A simplified yoga-based rehabilitation program is a complementary, safe and effective clinical treatment modality in patients with end-stage renal disease.

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

Vyas R, et al. (2008), conducted the study was designed to assess the effect of raja yoga meditation of Brahmakumaris which is very simple to practice, on serum lipids in normal Indian women. The methods and results of the study were 49 normal female volunteers were the subjects. They were divided into pre-menopausal (n=23) and post-menopausal (n=26) groups. They were further divided into non-meditators (who had never done any kind of meditation), 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-cholesterol in non-meditators were significantly more in post-menopausal women as compared to pre-menopausal women. Serum cholesterol and low density lipoprotein-cholesterol were significantly lowered in both short and long term meditators as compared to non-meditators in post-menopausal women. No significant difference was observed in lipid profile in pre-menopausal women. The conclusion of the study was Raja yoga meditation lowered serum cholesterol and low-density lipoprotein-cholesterol in post-menopausal women thus reducing the risk of coronary artery disease in them.
2.5 SUMMARY OF THE LITERATURE

The investigator has collected all the reviews related to yogic practices on related to motor ability, physiological, hematological and bio-chemical variables were collected from the library of TNPESU and on the internet to provide sufficient knowledge to the readers and for the effective analysis of the present study.

Also the reviews show that, the effect of yogic practices that there were significant changes on physiological, psychological and bio chemical variables. The investigator has found much more studies made on different yogic practices. So the research was interested in the same and found it would be more useful for corporate people for over all development Based on the experience gained the investigator formulated suitable methodology to be an applied in this research this is presented in chapter III.