

CHAPTER II

REVIEW OF RELATED LITERATURE

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

The purpose of the study was to find out the effect of yogic practices with and without diet modification on selected physiological, hormonal and psychological variables among menopausal women. 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 physiological variables in yoga and menopause
- Studies on hormonal variables in yoga and menopause
- Studies on psychological variables in yoga and menopause
- Studies on physiological variables in diet and menopause
- Studies on hormonal variables in diet and menopause
- Studies on psychological variables in diet and menopause
- Studies on other variables in yoga and diet on menopause
- Studies on selected variables in yoga and women
- Studies on selected variables in yoga and diet among others
- Summary of the literature.

2.1 STUDIES ON PHYSIOLOGICAL VARIABLES IN YOGA AND MENOPAUSE

Ram Kishore and Rameswar Pal (2014) evaluated the effects of yogic practice in some cardiovascular and respiratory parameters of overweight females after menopause. A total of 15 overweight ($BMI > 25 \text{ kg/m}^2$ and $< 30 \text{ kg/m}^2$) females after menopause were participated in a three weeks of yoga program for six days a week for one hour daily. Blood pressure and heart rate was recorded using Omron BP monitor. Rate pressure product and double product was measured using standard formula. Respiratory rate and breath holding time was recorded using standard protocol. Paired t test was performed to find out any significant different between the data collected before and after yogic practice. A significant decrement was noted in

body weight ($p < 0.001$) and mean ($p < 0.01$) blood pressure was decreased significantly after yogic practice. RPP an index of myocardial oxygen consumption and double product an index of load on the heart was decreased significantly.

Kumar A et.al., (2013) conducted a study on serum mineral status and climacteric symptoms in perimenopausal women before and after yoga therapy. A total of 30 subjects with perimenopausal symptoms, aged between 40 and 60 years were included in the study. Yoga intervention was given on daily basis 45 min duration for 12 weeks. The climacteric symptoms were assessed by Greene's climacteric scale and biochemical parameters were analyzed spectrophotometrically. The results of the study were a significant decrease in the waist hip ratio ($P < 0.036$) and body mass index ($P < 0.036$) was observed after yoga intervention. Systolic ($P < 0.064$) and diastolic ($P < 0.082$) blood pressure (BP) showed marginal decrease after yoga therapy. Climacteric symptoms improved significantly ($P < 0.001$) after yoga intervention. A significant increase ($P < 0.001$) in serum calcium and copper and a marked decrease in serum magnesium ($P < 0.05$) and ceruloplasmin ($P < 0.028$) levels was observed, post yoga therapy. Serum magnesium negatively correlated ($r = -0.467$, $P < 0.035$) with systolic BP after yoga intervention. They derived the conclusion from the study were overall changes observed in the mineral status and climacteric symptoms and suggested that yoga therapy protocol can be effectively used to improve the quality of life in perimenopausal women.

Lee Jeong-Ah et.al., (2012) studied the effect of yoga exercise on serum adiponectin and metabolic syndrome factors in obese postmenopausal Korean women. Sixteen healthy postmenopausal women aged 54.50 ± 2.75 years with more than 36 percent body fat were randomly assigned to either a yoga exercise group ($n = 8$) or to a no exercise control group ($n = 8$). The variables of body composition, visceral fat, serum adiponectin, and metabolic syndrome factors were measured in all the participants before and after the 16-week study. Body weight, percentage of body fat, lean body mass, body mass index, waist circumference, and visceral fat area had significantly decreased. High-density lipoprotein cholesterol and adiponectin had significantly increased, but total cholesterol, triglyceride, low-density lipoprotein cholesterol, blood pressure, insulin, glucose, and homoeostasis model assessment-insulin resistance had significantly decreased. Serum adiponectin concentrations were significantly correlated with waist circumference, high-density lipoprotein

cholesterol, diastolic blood pressure, and homoeostasis model assessment–insulin resistance in the post yoga exercise group. The study shown yoga exercise improves adiponectin level, serum lipids, and metabolic syndrome risk factors in obese postmenopausal women. Consequently, yoga exercise will be effective in preventing cardiovascular disease caused by obesity in obese postmenopausal Korean women.

Nirmala Vaze and Sulabha Joshi (2010) reviewed the multiple studies on yoga and menopausal transition in order to investigate effects of yoga on menopausal symptoms. Integrated approach of yoga therapy can improve hot flushes and night sweats. There is increasing evidence suggested that even the short-term practice of yoga can decrease both psychological and physiological risk factors for cardiovascular disease. Studies concluded that the age old therapy, Yoga, is fairly effective in managing menopausal symptoms.

Arnulfo Ramos-Jimenez et.al., (2009) evaluated the effect of an Intensive Hatha Yoga intervention (IHY) on cardiovascular risk factors in middle-aged and older women from Northern Mexico. In this prospective quasi experimental design used four middle-aged and nine older Conventional Hatha Yoga practicing females were enrolled into an 11-week IHY program consisting of five sessions per week for 90 min. The program adherence, asana performance, and work intensity were assessed along the intervention. Anthropometric variables such as body mass index (BMI), percentage of body fat and Σ skin folds, cardiovascular fitness variables such as 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 variables such as glucose, triacylglycerol (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. They found the results daily caloric intake (~1,916 kcal/day), program adherence (~85percent) 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 ($P < 0.01$). They concluded from the study proposed IHY program improves different cardiovascular risk factors (namely VO_{2max} and HDL-C) in middle-aged and older women.

Kim E. Innes et.al., (2008) evaluated the cardiovascular disease risk rises sharply with menopause, likely due to the coincident increase in insulin resistance and related atherogenic changes that together comprise the metabolic or insulin resistance syndrome, a cluster of metabolic and hemodynamic abnormalities strongly implicated in the pathogenesis and progression of cardiovascular disease through research reviews on related variables. Studied reviews shown the results were the traditional mind-body practices such as yoga, tai chi, and qigong may offer safe and cost-effective strategies for reducing insulin resistance syndrome-related risk factors for cardiovascular disease in older populations, including postmenopausal women. These practices may reduce insulin resistance and related physiological risk factors for cardiovascular disease; improve mood, well-being, and sleep; decrease sympathetic activation; and enhance cardio vagal function.

Cathryn Booth- LaForce et.al., (2007) conducted a pilot study of hatha yoga for menopausal symptoms to assess the feasibility and efficacy of a yoga treatment for menopausal symptoms. Both physiologic and self-reported measures of hot flashes were included. Participants were 12 peri- and post-menopausal women experiencing at least four menopausal hot flashes per day, at least four days per week. Assessments were administered before and after completion of a ten-week yoga program. Pre- and post-treatment measures included: Severity of questionnaire-rated menopausal symptoms (Wiklund Symptom Check List), frequency, duration, and severity of hot flashes (24-h ambulatory skin-conductance monitoring; hot-flash diary), interference of hot flashes with daily life (Hot Flash Related Daily Interference Scale), and subjective sleep quality (Pittsburgh Sleep Quality Index). Yoga classes included breathing techniques, postures, and relaxation poses designed specifically for menopausal symptoms. Participants were asked to practice at home 15 min each day in addition to weekly classes. They found the results from this study eleven women completed the study. Significant pre- to post-treatment improvements were found for severity of questionnaire-rated total menopausal symptoms, hot-flash daily interference; and sleep efficiency, disturbances, and quality. Neither 24-h monitoring nor accompanying diaries yielded significant changes in hot flashes. They have concluded from the study were the yoga treatment and study procedures were feasible for midlife women. Improvement in symptom perceptions and well-being warrant

further study of yoga for menopausal symptoms, with a larger number of women and including a control group.

Robert A Carels et.al., (2004) examined the impact of a six-month lifestyle change intervention on cardiovascular risk factors in obese, sedentary, postmenopausal women. A secondary aim of this investigation was to determine whether the addition of self-control skills training to an empirically supported lifestyle change intervention would result in greater cardiovascular risk reduction. Forty-four women were randomly assigned to receive either a lifestyle change or a lifestyle change with self-control skills intervention. Pretreatment and post treatment weight loss, body composition, physical activity, cardio respiratory fitness, diet, blood pressure (BP), blood lipids, and psycho-social functioning were assessed. Also, at one year post treatment, weight loss, body composition, self-reported physical activity, and psycho-social functioning were assessed. The women significantly increased their physical activity and cardio respiratory fitness and reduced their body weight fat mass body fat, BP, total cholesterol, triglycerides, and low-density lipoprotein, cholesterol and improved their diet ($p < 0.05$). At the 1-year follow-up, women had regained approximately 63 percent of their post treatment weight loss ($p < 0.05$), but had maintained their previous increases in physical activity. Additionally, there were no significant changes in fat free mass, body fat, anxiety, or depression between the end of treatment and one-year post treatment. The addition of self-control skills training did not significantly improve cardiovascular risk reduction. Lifestyle change interventions may be an effective means for reducing cardiovascular risk in obese, sedentary, postmenopausal women. However, greater attention should be devoted to the maintenance of these positive lifestyle changes.

2.2 STUDIES ON HORMONAL VARIABLES IN YOGA AND MENOPAUSE

Abhishek Chaturvedi et.al., (2016) studied the effect of hatha yoga therapy and regular physical exercise on the Fasting Blood Sugar (FBS), Glycated Haemoglobin (GHB), Thyroid Stimulating Hormone (TSH), serum cortisol and total plasma thiol levels in perimenopausal women. The study included 216 women with perimenopausal symptoms, 111 in test group (hatha yoga) and 105 in control group (physical exercise). The duration of intervention was 45 minutes every day for 12 weeks. Blood samples were collected in the pre and post intervention period.

Statistical significance was defined as $p < 0.05$. FBS and GHB ($p \leq 0.05$) showed a significant decrease after yoga therapy. Cortisol levels significantly ($p \leq 0.05$) increased in the post intervention period in the control group. However, it is maintained in the test group between the two time periods. The total plasma thiols level showed a rise in the post intervention period, significant rise ($p \leq 0.001$) in control group but not significant in the test group. The TSH levels were not altered in any group. It is concluded that exercise helps in maintaining the sugar levels but calming effects of yoga practice is important in relieving stress and enhancing health in perimenopausal women.

Marcia P Jorge et.al., (2016) investigated the psychophysiological effects of hatha yoga regular practice in post-menopausal women. Eighty-eight post-menopausal women volunteered to participate in a 12-week trial. Each woman was randomly assigned to a control group (no treatment), an exercise group, or a hatha yoga group. The researchers used surveys to measure the degree of menopause symptoms, stress, quality of life, depression, and anxiety. They also measured hormone levels to evaluate any changes in the physiology of the women. After 12 weeks of treatment, the yoga group showed lower degrees of menopausal symptoms, stress, and depression. They also had higher scores in quality of life than the control group or the exercise group. The control group, which did not receive any treatment, showed an increase in cortisol levels, which is the hormone that is released when people are stressed. In contrast, the yoga group did not have an increase in cortisol, which makes sense in light of their higher quality of life scores. FSH and LH are two hormones that dramatically increase in the blood stream during menopause. In fact, this increase is one of the physiological markers of menopause. In this study, both the yoga group and the exercise group showed significantly less LH and FSH in their blood stream than patients in the control group. These results suggested that yoga promotes positive psychophysiological changes in post-menopausal women and may be applied as a complementary therapy towards this population.

Abhishek Chaturvedi et.al., (2015) analyzed the effects of yoga on glycemic index, serum lipid profile, thyroid stimulating hormone (TSH), cortisol and antioxidant activity (AOA) in healthy perimenopausal women hailing from South Kanara district of Karnataka, India. A total of 111 women aged 40 to 60 years with perimenopausal symptoms were recruited considering inclusion and exclusion criteria

set for the study. Participants were checked for glycemic index, serum lipid profile, TSH, cortisol and AOA levels before and after 12-weeks of yoga intervention. Yoga therapy intervention resulted in significant decrease ($P=0.05$) in fasting blood sugar, glycated hemoglobin ($P=0.03$), total cholesterol (TC) ($P=0.06$), low density lipoprotein (LDL) ($P=0.04$), TC/HDL ratio ($P=0.002$). Serum triglyceride concentration is decreased whereas high density lipoprotein (HDL), TSH and AOA was increased within the normal range after the intervention, though the change was not statistically significant. Cortisol showed no significant change after yoga therapy intervention. Their findings indicated that yoga helps in improving the glycemic index, serum lipid profile, TSH and AOA in perimenopausal women. Thus it can be effectively used to improve the quality of life in perimenopausal women.

Khadka R et.al., (2013) studied the effect of yoga on female sex hormone level and heart rate variability in perimenopausal women. Twenty perimenopausal women were randomized into yoga ($n=10$, age 44 ± 2.64 years) and control ($n=10$, age 46 ± 5.09 years) groups. Subjects suffering from any diseases or on medication were excluded from the study. Yoga group practiced meditation, pranayama and few easy asanas for 30 min/day for a month. Control group did not do any yoga/relaxation or any active relaxation procedures. Short-term heart rate variability was recorded in all subjects at zero and one month. Institutional ethical committee approved the work. Both groups were comparable in term of their age, height, weight, BMI, systolic BP, diastolic BP, heart rate, and respiratory rate. Time domain measures of HRV, which are primarily markers of cardiac parasympathetic, were found increased in yoga group as compared to control group after yoga. High frequency power, which is also one of the markers of parasympathetic activity, increased in yoga group as compared to control group. Both serum estrogen ($11.95(5.05-41.32)$ vs $24.47(12.54-64.90)$ pg/ml, $p=0.036$) and progesterone ($0.24(0.10-1.02)$ vs $2.0(0.25-9.73)$ ng/ml, $p=0.012$) levels were found increased in yoga group after yogic intervention. They concluded from the study were parasympathetic activity, estrogen and progesterone levels increased in perimenopausal women after a month of yoga practice. Increased parasympathetic activity and female sex hormone levels indicate that yoga can be a cardio protective alternative therapeutic measure in peri-menopausal women.

Thirthalli J et.al., (2013) aimed to find the role of yoga as an antidepressant as well as its action on lowering the serum cortisol levels. Setting and design of the study were an open-labeled study consisting of three groups (yoga alone, yoga along with antidepressant medication and antidepressant medication alone) was conducted at a tertiary care psychiatry hospital. Depressive out patients who were not suicidal were offered yoga as a possible antidepressant therapy. A validated yoga module was used as therapy taught over a month and to be practiced at home daily. Patients were free to choose the drugs if their psychiatrist advised. Patients (n=54) were rated on Hamilton Depression Rating Scale (HDRS) with serum cortisol measurements at baseline and after 3 months. In 54 patients, assessments and blood test results were both available. 19 each received yoga alone or with drugs and 16 received drugs only. Healthy comparison subjects (n=18) too underwent morning cortisol measurements once. Results of the study were serum cortisol was higher in depressives compared with controls. In the total sample, the cortisol level dropped significantly at the end of treatment. More patients in the yoga groups had a drop in cortisol levels as compared to drug-only group. In the yoga-only group, the cortisol drop correlated with the drop in HDRS score (antidepressant effect). The findings supported that yoga may act at the level of the hypothalamus by its anti-stress effects (reducing the cortisol), to bring about relief in depression.

Francisca M Vera et.al., (2009) examined the effects of long-term yoga practice on Subjective Sleep Quality (SSQ) and on several hormonal parameters of the hypothalamus–pituitary–adrenal (HPA) axis. Twenty-six subjects (16 experimental and 10 controls) were recruited to be part of the study. Experimental subjects were regular yoga practitioners with a minimum of three years of practice. Blood samples for the quantification of adrenocorticotrophic hormone (ACTH), cortisol and dehydroepiandrosterone sulphate (DHEA-S) were drawn from all subjects. Likewise, the Pittsburgh Sleep Quality Index (PSQI) was employed to assess SSQ. As statistical analysis, Mann–Whitney U-test was performed. The yoga group displayed lower PSQI scores and higher blood cortisol levels than control subjects. Therefore, it can be concluded that long-term yoga practice is associated with significant psychobiological differences, including better sleep quality as well as a modulatory action on the levels of cortisol. These preliminary results suggest interesting clinical implications which should be further researched.

Bosch PR et.al., (2009) did a pilot study on functional and physiological effects of yoga in women with rheumatoid arthritis. They investigated neuroendocrine and physical function in women with RA can be altered through a yoga intervention. Exercise intervention research conducted at a medical clinic among sixteen independently living, postmenopausal women with an RA classification of I, II, or III according to the American College of Rheumatology functional classification system served as either participants or controls. The study group participated in three 75-minute yoga classes a week over a 10-week period. At baseline and on completion of the 10-week intervention, diurnal cortisol patterns and resting heart rate were measured. Balance was measured using the Berg Balance Test. Participants completed the Health Assessment Questionnaire (HIQ), a visual analog pain scale, and the Beck Depression Inventory. Yoga resulted in a significantly decreased HAQ disability index, decreased perception of pain and depression, and improved balance. Yoga did not result in a significant change in awakening or diurnal cortisol patterns ($P = .12$).

Chattha R et.al., (2008) studied the efficacy of an integrated approach of yoga therapy (IAYT) on cognitive abilities in climacteric syndrome. A randomized control study the participants one hundred and eight perimenopausal women, age between 40 and 55 years with follicle-stimulating hormone level equal to or greater than 15 min/ml were divided into experimental (yoga) and control groups. They conducted in fourteen centers of Swami Vivekananda Yoga Research Foundation; Bangalore, India, The yoga group practiced a module comprising breathing practices, sun salutation and cyclic meditation, whereas the control group practiced a set of simple physical exercises, under supervision (one hour/day, five days/week for eight weeks). Assessments were made by vasomotor symptom checklist, six-letter cancellation test (SLCT) for attention and concentration and Punit Govil Intelligence Memory Scale (PGIMS) with ten sub tests. The results were the Wilcoxon test showed significant ($P < 0.001$) reduction in hot flushes, night sweats and sleep disturbance in yoga group, with a trend of significant difference between groups at $P = 0.06$ on Mann–Whitney test in night sweats. There was no change within or between groups in the control group. The SLCT score and the PGIMS showed significant improvement in eight of ten sub tests in the yoga group and six of ten sub tests in the control group. The yoga group performed significantly better ($P < 0.001$) with higher effect sizes in SLCT and seven tests of PGIMS compared with the control group. Conclusion from the study were integrated approach of yoga therapy can

reduce hot flushes and night sweats. It also can improve cognitive functions such as remote memory, mental balance, attention and concentration, delayed and immediate recall, verbal retention and recognition tests.

Verzosa Sophia M L (1998) examined the effect of a ten week yoga intervention on quality of life related to menopausal symptoms and to determine if there were associated changes in circulating DHEA-S and FSH. Seventeen inactive women volunteer between ages 45 and 60 experiencing menopause-related symptoms were participated. Women were randomly assigned to either a ten week hatha yoga program (N= 10, age= 51.6 ± 4.2 , BMI= 27.2 ± 5.8) or an active control group who completed a ten week walking program (N=7, age= 53.1 ± 4.1 , BMI= 27.6 ± 6.7). Both groups completed the Menopause Specific Quality of Life questionnaire (MENQOL) at week 0, 3, 7, and 11 of the intervention to assess symptoms over four domains; vasomotor, psycho-social, physical, and sexual. Repeated measures ANOVA showed a trend for reduction in the vasomotor domain ($p= 0.096$) and summary score ($p=0.066$) for MENQOL in both groups. A trend towards reduction was seen for time ($p= 0.066$) and time by group ($p= 0.074$) for FSH. No changes in circulating DHEA-S were observed for either group. This suggests that 10 weeks of either yoga or walking will improve vasomotor symptoms of menopause, although this effect did not appear to be associated with changes in DHEA-S or FSH. An intervention longer than 10 weeks may be necessary to see changes in other domains of quality of life among menopausal women

Irena Shanti (1993) studied the effects of yoga-therapy practice on estradiol level and symptoms of menopause, and hormonal imbalances: hot flushes, uro-genital dryness, emotional instability, insomnia, tiredness, depression, migraine, infertility, hair loss, etc. To control the results she asked the participants a blood test of estradiol before beginning the practice, which should be repeated each four months and a questionnaire to evaluate the intensity of symptoms, repeated every month. The results of the study were 100 percent of the clients, in three to four months of practice, without medication, either had no more symptoms and if there was any symptom, their intensity was near zero. There was 254 percent average increase in hormone level in four months, with 30 minutes of exercises each other day. Average age of students was 47 years, but being older than that did not hinder the results, some clients over 70 had good results, reactivating the hormone production and getting rid

of symptoms. Irritability, neurasthenia, emotional instability, crying spells, insomnia, anxiety, stress and other emotional symptoms as discouragement, tiredness and depression, disappeared in two to three months of practice. 100 percent of cases of PMT, migraine, stress and panic syndrome were eliminated completely or had their intensity near zero.

2.3 STUDIES ON PSYCHOLOGICAL VARIABLES IN YOGA AND MENOPAUSE

Grindler NM and Santoro NF (2015) suggested that regular physical exercise reduces mortality and extends the functional life span of men and women. They narrated from the accumulated data the current medical literature including randomized clinical trials and clinical guidelines that address the benefits of physical fitness and regular exercise on the health of midlife and postmenopausal women. Reduction and avoidance of obesity and its related comorbidities (hypertension, glucose intolerance, dyslipidemia, and heart disease) are one major benefit of exercise. However, long-term physical exercise is also associated with reduced rates of cancer, dementia and cognitive decline, adverse mood and anxiety symptoms, and reduction of osteoporosis, osteopenia, falls, and fractures. Beneficial physical activity includes exercise that will promote cardiovascular fitness (aerobic), muscle strength (resistance), flexibility (stretching), and balance (many of the preceding, and additional activities such as yoga).

Carpenter JS et.al., (2015) did a study on alleviating menopausal symptoms with the objective of describe self-reported menopausal symptom priorities and their association with demographics and other symptoms among participants in an intervention trial for vasomotor symptoms (VMS). Methods Cross-sectional study embedded in the MsFLASH 02 trial, a three-by-two factorial design of yoga vs. exercise vs. usual activity and omega-3-fatty acid vs. placebo. At baseline, women (n = 354) completed hot flush diaries, a card sort task to prioritize symptoms they would most like to alleviate, and standardized questionnaires. Results of the study were the most common symptom priorities VMS (n = 322), sleep (n = 191), concentration (n = 140), and fatigue (n = 116). In multivariate models, women who chose VMS as their top priority symptom (n = 210) reported significantly greater VMS severity (p = 0.004) and never smoking (p = 0.012),

and women who chose sleep as their top priority symptom ($n = 100$) were more educated ($p \leq 0.001$) and had worse sleep quality ($p < 0.001$). ROC curves identified sleep scale scores that were highly predictive of ranking sleep as a top priority symptom. Conclusions of the study were among women entering an intervention trial for VMS and with relatively low prevalence of depression and anxiety, VMS was the priority symptom for treatment. A card sort may be a valid tool for quickly assessing symptom priorities in clinical practice and research.

Cramer H et.al., (2015) evaluated the effects of a 12-week traditional Hatha yoga and meditation intervention on menopausal symptoms in breast cancer survivors. Patients were randomly assigned either to a 12-week yoga and meditation intervention or to usual care. The primary outcome measure was total menopausal symptoms (Menopause Rating Scale [MRS] totals score). Secondary outcome measures included MRS sub scales, quality of life (Functional Assessment of Cancer Therapy-Breast), fatigue (Functional Assessment of Chronic Illness Therapy-Fatigue), depression, and anxiety (Hospital Anxiety and Depression Scale). Outcomes were assessed at week 12 and week 24 after randomization. In total, 40 women (mean age \pm standard deviation, 49.2 ± 5.9 years) were randomized to yoga ($n = 19$) or to usual care ($n = 21$). Women in the yoga group reported significantly lower total menopausal symptoms compared with the usual care group at week 12 (mean difference, -5.6 ; 95 percent confidence interval, -9.2 to -1.9 ; $P = .004$) and at week 24 (mean difference, -4.5 ; 95 percent confidence interval, -8.3 to -0.7 ; $P = .023$). At week 12, the yoga group reported less somato vegetative, psychological, and urogenital menopausal symptoms; less fatigue; and improved quality of life (all $P < .05$). At week 24, all effects persisted except for psychological menopausal symptoms. Short-term effects on menopausal symptoms remained significant when only women who were receiving antiestrogen medication ($n = 36$) were analyzed. Six minor adverse events occurred in each group. Yoga combined with meditation can be considered a safe and effective complementary intervention for menopausal symptoms in breast cancer survivors.

Nayak G et.al., (2014) investigated the effects of yoga therapy on physical and psychological symptoms vasomotor and sexual symptoms of perimenopause using the standardized questionnaire. A prospective non-randomized control study of 216 perimenopausal women with 12 weeks of intervention were divided in two

groups with either yoga therapy (n = 111) or exercise (n = 105) as the interventional tool. The symptoms control and QOL before and after intervention in both the groups were assessed by using the menopausal QOL questionnaire. They found the results were the perimenopausal symptoms in all the four domains were improved by yoga therapy, thus significantly improving the overall QOL compared to the control group. This study clearly demonstrated the effectiveness of yoga therapy in managing the distressing perimenopausal symptoms. It is easy, safe, non-expensive alternative therapy helping the well-being of perimenopausal women and must be encouraged in the regular management of perimenopausal symptoms.

Reed SD et.al., (2014) determined the efficacy of three non-hormonal therapies for the improvement of menopause-related quality of life in women with vasomotor symptoms. They conducted a 12-week 3 × 2 randomized, controlled, factorial design trial. Peri- and postmenopausal women, 40-62 years old, were assigned randomly to yoga (n = 107), exercise (n = 106), or usual activity (n = 142) and also assigned randomly to a double-blind comparison of omega-3 (n = 177) or placebo (n = 178) capsules. Weekly 90-minute yoga classes with daily at-home practice, Individualized facility-based aerobic exercise training 3 times/week, and 0.615 g omega-3 supplement, three times/day were given to the participants. The outcomes were assessed Menopausal Quality of Life Questionnaire (MENQOL) total and domain (vasomotor symptoms, psycho-social, physical and sexual). Among 355 randomly assigned women who average age was 54.7 years, 338 women completed 12-week assessments. Mean baseline vasomotor symptoms frequency was 7.6/day, and the mean baseline total MENQOL score was 3.8 (range, 1-8 from better to worse) with no between-group differences. For yoga compared to usual activity, baseline to 12-week improvements were seen for MENQOL total -0.3 (95percent confidence interval, -0.6 to 0; P = .02), vasomotor symptom domain (P = .02), and sexuality domain (P = .03) scores. For women who underwent exercise and omega-3 therapy compared with control subjects, improvements in baseline to 12-week total MENQOL scores were not observed. Exercise showed benefit in the MENQOL physical domain score at 12 weeks (P = .02). They found that, among healthy sedentary menopausal women, yoga appears to improve menopausal quality of life; the clinical significance of finding is uncertain because of the modest effect.

Baskaran Jayabharathi and Arulappan Judie (2014) conducted a complementary health approach to quality of life in menopausal women: a community-based interventional study in selected areas in Kattankulathur Block, Kanchipuram District, Tamil Nadu, India. A simple random sampling technique was used to select menopausal women for the study. A total of 260 menopausal women identified, 130 were allocated to a study group and 130 to a control group. The study group underwent yoga training for one and half hours per day on five consecutive days. After the five-day intensive yoga training program, the menopausal women practiced yoga daily at home for 35–40 minutes a day. Along with daily yoga practice, they underwent group yoga practice for two days a week under the supervision of one of the investigators until 18 weeks. The yoga training program consisted of yogasanas, pranayama and meditation. The standardized World Health Organization QoL BREF scale was used to assess the women quality of life. They distributed an instruction manual on steps of selected yoga practice for the women self-reference at home after the five days of continuous yoga practice. A yoga practice diary was used to confirm regular performance of yoga. The women in the control group did not participate in the yoga program; however, on completion of the study, these women received intensive yoga training for five days. They found the results from the study were an extremely high statistically significant difference ($P=0.001$) between the study group and the control group with regard to the physical, psychological, social, and environmental domains of quality of life after six, twelve, and eighteen weeks of yoga therapy. In the study group, the physical, psychological, social, and environmental domains of quality of life were greatly improved by practicing yoga for 18 weeks. No adverse events were reported by the women after yoga practice. They concluded that yoga is an effective complementary health approach for improving quality of life in menopausal women.

Afonso RF et. al., (2012) evaluated the effect of yoga practice on the physical and mental health and climacteric symptoms of postmenopausal women not undergoing hormone therapy with a diagnosis of insomnia, who were 50 to 65 years old, who had an apnea-hypopnea index less than 15, were randomly assigned to one of three groups, as follows: control, passive stretching, and yoga. Questionnaires were administered before and four months after the intervention to evaluate quality of life, anxiety and depression symptoms, climacteric symptoms, insomnia severity, daytime sleepiness, and stress. The volunteers also underwent polysomnography. The study

lasted four months. There were 44 volunteers at the end of the study. When compared with the control group, the yoga group had significantly lower post treatment scores for climacteric symptoms and insomnia severity and higher scores for quality of life and resistance phase of stress. The reduction in insomnia severity in the yoga group was significantly higher than that in the control and passive-stretching groups. This study showed that a specific sequence of yoga might be effective in reducing insomnia and menopausal symptoms as well as improving quality of life in postmenopausal women with insomnia.

Joshi S et.al., (2011) observed the effect of yoga on menopausal symptoms using a prospective, randomized, controlled and interventional study. Main outcome measures Total Menopause Rating Scale (MRS) score and three subscale scores (somatovegetative, psychological and urogenital) were measured on day one and day 90 in the study group which performed yoga (asana, pranayama and meditation) under supervision for three months, and were compared with the control group that did not perform yoga. MRS has been designed to measure health-related quality of life of ageing women. It consists of 11 symptoms and three sub scales. The study was observed that on day one the scores in both the groups were comparable. On day 90, the scores in the yoga group showed a reduction in score on all the sub scales, which was statistically significant. No significant difference was noted in the control group. They concluded from the study yoga is effective in reducing menopausal symptoms and should be considered as alternative therapy for the management of menopausal symptoms.

Elavsky S and McAuley E (2009) examined the contribution of personality factors to the reporting of menopausal symptoms in the context of a four-month randomized controlled exercise trial. Symptomatic middle-aged women (N = 164 M age = 49.9, SD = 3.6) completed measures of menopausal symptoms, personality, physical activity, fitness and body composition assessment at the beginning and end of a four-month randomized controlled trial involving walking and yoga. After controlling for baseline values, psychological symptoms at the end of the trial were associated with trait anxiety (beta = .47, $p < .001$) and changes in fitness (beta = -.20, $p < .01$); vasomotor symptoms with optimism (beta = -.18, $p < .05$) and changes in fitness (beta = -.15, $p = .053$); and sexual symptoms were associated with changes in fitness (beta = -.16, $p < .05$). Personality characteristics partially explain symptom

reports during menopause however improvements in physical parameters such as fitness may reduce reported symptomatology.

Chattha et.al., (2008) studied the effect of yoga on the climacteric symptoms, perceived stress, and personality in perimenopausal women. One hundred twenty participants (ages 40-55 years) were randomly divided into two study arms, yoga and control. The yoga group practiced an integrated approach to yoga therapy comprising surya namaskara (sun salutation) with 12 postures, pranayama (breathing practices), and avartan dhyan (cyclic meditation), whereas the control group practiced a set of simple physical exercises under supervision of trained teachers for eight weeks (one hour daily, five days per week). The assessments were made by Greene Climacteric Scale, Perceived Stress Scale, and Eysenck's Personality Inventory before and after the intervention. The results of the study were three factors of the Greene Climacteric Scale, the Mann-Whitney test showed a significant difference between groups ($P < 0.05$) in the vasomotor symptoms, a marginally significant difference ($P = 0.06$) in psychological factors but not in the somatic component. Effect sizes were higher in the yoga group for all factors. There was a significantly greater degree of decrease in Perceived Stress Scale scores ($P < 0.001$, independent samples t test) in the yoga group compared with controls (between-group analysis) with a higher effect size in the yoga group (1.10) than the control (0.27). On the Eysenck's Personality Inventory, the decrease in neuroticism was greater ($P < 0.05$) in the yoga group (effect size = 0.43) than the control group (effect size = 0.21) with no change in extroversion in either the yoga or control group. They concluded from the study were eight weeks of an integrated approach to yoga therapy decreases climacteric symptoms, perceived stress, and neuroticism in perimenopausal women better than physical exercise.

Elavsky S and McAuley E (2007) examined the effects of walking and yoga on multidimensional self-esteem and roles played by self-efficacy, body composition, and physical activity in changes in esteem. They designed for the study was four-month randomized controlled exercise trial with three arms: walking, yoga, and control. Subjects were previously low-active middle-aged women ($n = 164$; M age = 49.9; $SD = 3.6$). Intervention of the study was structured and supervised walking program meeting three times per week for one hour and supervised yoga program meeting twice per week for 90 minutes. They measured Body composition, fitness assessment, and battery of psychological measures. Analysis used for the study Panel

analysis within a structural equation modeling framework using Mplus 3.0. The results of the study were the walking and yoga interventions failed to enhance global or physical self-esteem but improved sub domain esteem relative to physical condition and strength (for walking) and body attractiveness (for both walking and yoga). Over time the effects of physical activity, self-efficacy, and body fat on changes in physical self-esteem and global esteem were mediated by changes in physical condition and body attractiveness sub domain esteem. Women reporting greater levels of self-efficacy and physical activity with lower body fat also reported greater enhancements in sub domain esteem. These results provided support for the hierarchic and multidimensional nature of self-esteem and indicate that middle-aged women may enhance certain aspects of physical self-esteem by participating in physical activity.

Elavsky S and McAuley E (2007) examined the effects of a four-month randomized controlled exercise trial on mental health outcomes in 164 previously low-active middle-aged women (M age=49.9; SD=3.6). Participants completed body composition and fitness assessment and a battery of psychological measures at the beginning and end of a four-month randomized controlled exercise trial with three arms: walking, yoga, control. The results indicated that walking and yoga were effective in enhancing positive affect and menopause-related QOL and reducing negative affect. Women who experienced decreases in menopausal symptoms across the trial also experienced improvements in all positive mental health and QOL outcomes and reductions in negative mental health outcomes. Whether menopausal symptoms increased or decreased across the trial appeared to be determined in part by whether there were increases or decreases in cardiorespiratory fitness. They derived the conclusion from the study were the physical activity appears to enhance mood and menopause-related QOL during menopause, however, other aspects of mental health may be affected only as a result of reduction in menopausal symptoms. Increasing cardiorespiratory fitness could be one way to reduce menopausal symptoms.

2.4 STUDIES ON PHYSIOLOGICAL VARIABLES IN DIET AND MENOPAUSE

Vishal R. Tandon et.al., (2014) evaluated the effect of life-style modification on postmenopausal (PM) overweight and obese Indian women in a randomized controlled 24 week study. Two groups were formed Group I (n = 30) was designated as intervention (dietary and exercise group) and Group II (n = 24) served as control. Comparison of weight, waist circumference (WC) and body mass index (BMI) were made and compared among two groups at 4, 8, 16 and 24 weeks. Mean age at menopause was 48.35 years versus 49.65 years; mean number of menopausal symptoms were 5.70 ± 1.76 versus 5.10 ± 1.56 and mean duration since menopause was 2.70 versus 2.90 years in Groups I and II respectively. When the effect of Group I and control on weight was compared at 4, 8, 16 and 24 weeks, there was no significant difference between them up to 8 week. At 8 weeks Group I caused a significant decrease in weight ($P \leq 0.05$) when compared with control arm and which continued throughout the study period ($P < 0.05$) at both 16 and 24 weeks. Group I produced a significant reduction in WC from 8 weeks onwards up to 24 weeks ($P \leq 0.05$). BMI was statistically significant in Group I and the effect started at 4(th) week ($P \leq 0.05$) and the differences in BMI reduction were highly significant at 16(th) and 24(th) weeks ($P \leq 0.001$). The results of the study strongly recommend the life-style management to be incorporated in daily style of postmenopausal women under controlled supervision.

Gregorio L et.al., (2014) studied a cross-sectional observational analysis of the relationship of dietary protein on body composition and physical performance in clinical research center from 387 healthy women aged 60 - 90 years (mean 72.7 ± 7.0 years). Measures included body composition (fat-free mass, appendicular skeletal mass and fat mass) via dual x-ray absorptiometry (DXA), physical performance (Physical Performance Test (PPT) and Short Physical Performance Battery (SPPB), handgrip strength, Physical Activity Scale in the Elderly (PASE), quality of life measure (SF-8), falls, fractures, nutrient and macromolecule intake (four-day food record). Independent samples t-tests determined mean differences between the above or below RDA protein groups. Analysis of covariance was used to control for body mass index (BMI) between groups when assessing physical performance, physical activity and health-related quality of life. The subjects consumed an average of 72.2 g protein/day representing 1.1 g protein/kg body weight/day. Subjects were categorized

as below the recommended daily allowance (RDA) for protein (defined as less than 0.8 g protein/kg) or at or above the RDA (equal to or higher than 0.8 g protein/kg). Ninety-seven subjects (25 percent) were in the low protein group, and 290 (75 percent) were in the higher protein group. Women in the higher protein group had lower body mass, including fat and lean mass, and fat-to-lean ratio than those in the lower-protein group ($p < 0.001$). Composite scores of upper and lower extremity strength were impaired in the group with low protein intake; SPPB score was 9.9 ± 1.9 compared to 10.6 ± 1.6 in those with higher protein intake and PPT was 19.8 ± 2.9 compared to 20.9 ± 2.1 in the low and higher protein groups, respectively. The results were attenuated by correction for BMI, but remained significant. The physical component of the SF-8 was also lower in the low protein group but did not remain significant when controlling for BMI. No significant differences were found in hand grip strength or reported physical activity. Healthy, older postmenopausal women consumed, on average, 1.1 g/kg/d protein, although 25 percent consumed less than the RDA. Those in the low protein group had higher body fat and fat-to-lean ratio than those who consumed the higher protein diet. Upper and lower extremity function was impaired in those who consumed a low protein diet compared to those with a higher protein intake. Protein intake should be considered when evaluating the multifactorial loss of physical function in older women.

Huang YW et.al., (2014) did a study on vegan diet and blood lipid profiles: a cross-sectional study of pre and postmenopausal women. Demographic data and lipid profiles were obtained from the 2002 Taiwanese Survey on Hypertension, Hyperglycemia and Hyperlipidemia. Multivariate linear regression analysis was used to examine factors significantly and independently associated with different categories of veganism and to estimate the β value of lipid profiles in the dietary types. A total of 2397 premenopausal and 1154 postmenopausal participants who did not receive lipid lowering drugs were enrolled. Premenopausal vegans had significantly lower HDL-C and higher TG, LDL-C/HDL-C, total cholesterol (TC)/HDL-C and TG/HDL-C compared with omnivores. For postmenopausal women, vegans had lower TC while ovo-lacto vegetarians were observed with low HDL-C when compared with omnivores. Multivariate linear regression analyses showed that vegan and ovo-lacto vegetarian diets decreased HDL-C levels in premenopausal women ($\beta = -7.63$, $p = 0.001$ and $\beta = -4.87$, $p = 0.001$, respectively). There were significant associations between lower LDL-C and ovo-lacto vegetarian

diets ($\beta = -7.14$, $p = 0.008$) and also between TG and vegan diet ($\beta = 23.37$, $p = 0.008$), compared with omnivorous diet. Post-menopausal women reported to have consumed either a vegan or an ovo-lacto vegetarian diet were at the risk of having low HDL-C unlike those that consumed omnivorous diets ($\beta = -4.88$, $p = 0.015$ and $\beta = -4.48$, $p = 0.047$). There were no significant changes in LDL-C in both pre and postmenopausal vegans. Vegan diet was associated with reduced HDL-C level. Because of its effects on lowering HDL-C and LDL-C, ovo-lacto vegetarian diet may be more appropriate for premenopausal women.

Janet Jull et.al., (2014) determined the effectiveness of exercise and/or nutrition interventions and to address body weight changes during the menopause transition. A systematic review of the literature was conducted using electronic databases, grey literature, and hand searching. Two independent researchers screened for studies using experimental designs. Studies were quality appraised using Cochrane risk of bias. Included studies were in women during their menopause transition are needed. Evidence from one higher quality study analyzed descriptively. 3,564 unique citations screened, three studies were eligible (two randomized controlled trials, and one pre/post study). Study quality ranged from low to high risk of bias. One randomized controlled trial with lower risk of bias concluded that participation in an exercise program combined with dietary interventions might mitigate body adiposity increases, which is normally observed during the menopause transition. The other two studies with higher risk of bias suggested that exercise might attenuate weight loss or weight gain and change abdominal adiposity patterns. High quality studies evaluated the effectiveness of interventions targeting body weight changes indicated an effective multifaceted intervention for women to minimize changes in body adiposity.

Josse AR, et.al., (2012) determined whether higher intakes of dairy foods, dietary calcium, and protein during diet- and exercise-induced weight loss affected markers of bone health among premenopausal overweight and obese women. Ninety participants were randomized into three groups ($n = 30$ per group): high protein and high dairy (HPHD), adequate protein and medium dairy (APMD), and adequate protein and low dairy (APLD), differing in dietary protein (30, 15, or 15 percent of energy, respectively), dairy foods (15, 7.5, or <2 percent of energy from protein, respectively), and dietary calcium (~ 1600 , ~ 1000 , or <500 mg/d, respectively). Serum and urine bone turnover biomarkers, serum osteoprotegerin (OPG), receptor

activator of nuclear factor- κ B ligand (RANKL), PTH, 25-hydroxyvitamin D, leptin, and adiponectin measured at 0 and 16 wk. All groups lost equivalent body weight ($P < 0.05$). N-telopeptide, C-telopeptide (CTX), urinary deoxypyridinoline, and osteocalcin increased in APLD ($P < 0.01$), whereas in HPHD, osteocalcin and procollagen 1 amino-terminal propeptide (P1NP) increased ($P < 0.05$), and all resorption markers remained unchanged. P1NP to CTX and OPG to RANKL ratios increased in HPHD ($P < 0.005$), and P1NP to CTX ratio decreased in APLD ($P < 0.05$). PTH decreased in HPHD and APMD vs. APLD ($P < 0.005$), and 25-hydroxyvitamin D increased in HPHD ($P < 0.05$), remained unchanged in APMD, and decreased in APLD ($P < 0.05$). Leptin decreased and adiponectin increased in APMD and HPHD only ($P < 0.001$). Hypo energetic diets higher in dairy foods, dietary calcium, and protein with daily exercise, favorably affected important bone health biomarkers vs. diets with less of these bone-supporting nutrients.

Kroenke CH et.al., (2012) determined whether a dietary intervention designed to reduce fat intake and increase intake of fruit, vegetables, and whole grains, and weight loss, reduces vasomotor symptoms in postmenopausal women. They included 17,473 postmenopausal US women, ages 50 to 79 years, at baseline who participated in the Women's Health Initiative Dietary Modification trial and were not taking menopausal hormone therapy. Logistic regression was used to evaluate associations. In multivariate-adjusted analyses, with simultaneous adjustment for the intervention and weight change, assignment to the dietary intervention versus the control arm was significantly 1.14; 95percent CI, 1.01-1.28 related to a higher likelihood of symptom elimination among women with VMS at baseline. In addition, women with symptoms at baseline who lost 10 lb or more (OR, 1.23; 95percent CI, 1.05-1.46) or lost 10percent or more of their baseline body weight (OR, 1.56; 95percent CI, 1.21-2.02) between baseline and year one were significantly more likely to eliminate VMS compared with those who maintained weight. Upon examining the joint effect of the dietary modification and weight loss, compared with women in the control arm who maintained weight, women who lost substantial weight (≥ 10 percent) as a part of the intervention (OR, 1.89; 95percent CI, 1.39-2.57) but not as part of the control arm (OR, 1.40; 95percent CI, 0.92-2.13) were significantly more likely to end VMS, although these two groups did not differ significantly from each other. Large weight loss (>22 lb), but not dietary changes, was related to the elimination of

moderate/severe VMS. Weight loss as part of a healthy dietary modification may help eliminate VMS among postmenopausal women.

Foster- Schubert KE et.al., (2012) conducted a year-long, 4-arm randomized trial among 439 overweight-to-obese postmenopausal sedentary women to determine the effects of a calorie-reduced, low-fat diet (D), a moderate-intensity, facility-based aerobic exercise program (E), or the combination of both interventions (D+E), vs. a no-lifestyle-change control (C) on change in body weight and composition. The group-based dietary intervention had a weight-reduction goal of ≥ 10 percent, and the exercise intervention consisted of a gradual escalation to 45 min aerobic exercise 5 d/wk. Participants were predominantly non-Hispanic Whites (85 percent) with a mean age of 58.0 ± 5.0 years, a mean BMI of 30.9 ± 4.0 kg/m² and an average of 47.8 ± 4.4 percent body fat. Baseline and 12-month weight and adiposity measures were obtained by staff blinded to participants' intervention assignment. 399 women completed the trial (91 percent retention). Using an intention-to-treat analysis, average weight loss at 12 months was -8.5 percent for the D group ($P < 0.0001$ vs. C), -2.4 percent for the E group ($P = 0.03$ vs. C), and -10.8 percent for the D+E group ($P < 0.0001$ vs. C), while the C group experienced a non-significant -0.8 percent decrease. BMI, waist circumference, and percent body fat were also similarly reduced. Among postmenopausal women, lifestyle change involving diet, exercise, or both combined over one year improves body weight and adiposity, with the greatest change arising from the combined intervention.

Palasuvan A et.al., (2011) investigated whether regular practice of mind-body exercise (yoga and/or tai chi) alters dietary intake and antioxidant status and balances the menopause-related increases in lipid peroxidation and cardiovascular risk. The objective of the study was the decline in antioxidant defenses due to both estrogen loss and frequent adoption of poor dietary choices exposes postmenopausal women to cardiovascular diseases. The design of the study was Cross-sectional study. The study was conducted in an urban community in Bangkok, Thailand between May and August 2007. Premenopausal (Pre M; 39 ± 8 yrs; $n = 56$) and postmenopausal (Post M; 54 ± 5 yrs; $n = 39$) women who had been practicing yoga (Y) and/or tai chi (TC) more than 3 hours/week for a year, or who had no regular physical activity practice (sedentary, S). All participants completed food frequency questionnaires and 4-day food and activity records. Blood was collected on day five. Factorial ANOVA tests were performed according to menopause status, exercise, and hormone replacement

therapy (HRT) groups. The results of the study were Post M had higher ($p = 0.01$) dietary fiber intake compared with Pre M. Yoga practitioners had lower BMI ($p = 0.004$) and lower fat intake ($p = 0.02$) compared with their S and TC counterparts. Plasma total antioxidant status was significantly and independently lower and higher in Y and Post M groups, respectively. However, no difference was shown after adjusting for BMI. Regardless of menopause status and HRT, the activity of erythrocyte glutathione peroxidase - an aerobic training-responsive enzyme - was higher ($p < 0.001$) in TC practitioners compared with other groups. No effects were shown on erythrocyte superoxide dismutase activity, plasma lipid peroxidation (TBARS) or total homocysteine concentrations. They have concluded from the study were yoga and tai chi exercises can be used as components of a strategy to promote healthy lifestyles (balanced diet and moderate intensity exercise) in vulnerable populations, such as menopausal women, in order to prevent aging induced oxidative stress-related diseases.

Josse AR et.al., (2011) determined how daily exercise (resistance and/or aerobic) and a hypo energetic diet varying in protein and calcium content from dairy foods would affect the composition of weight lost in otherwise healthy, premenopausal, overweight, and obese women. Ninety participants were randomized to 3 groups ($n = 30/\text{group}$): high protein, high dairy (HPHD), adequate protein, medium dairy (APMD), and adequate protein, low dairy (APLD) differing in the quantity of total dietary protein and dairy food-source protein consumed: 30 and 15percent, 15 and 7.5percent, or 15 and <2percent of energy, respectively. Body composition was measured by DXA at 0, 8, and 16 wk and MRI ($n = 39$) to assess visceral adipose tissue (VAT) volume at 0 and 16 wk. All groups lost body weight ($P < 0.05$) and fat ($P < 0.01$); however, fat loss during wk 8-16 was greater in the HPHD group than in the APMD and APLD groups ($P < 0.05$). The HPHD group gained lean tissue with a greater increase during 8-16 wk than the APMD group, which maintained lean mass and the APLD group, which lost lean mass ($P < 0.05$). The HPHD group also lost more VAT as assessed by MRI ($P < 0.05$) and trunk fat as assessed by DXA ($P < 0.005$) than the APLD group. The reduction in VAT in all groups was correlated with intakes of calcium ($r = 0.40$; $P < 0.05$) and protein ($r = 0.32$; $P < 0.05$). Therefore, diet- and exercise-induced weight loss with higher protein and increased dairy product intakes promotes more favorable body composition

changes in women characterized by greater total and visceral fat loss and lean mass gain.

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. Material and method of the study were a single group of 47 persons were assessed on the first and last day of a yoga and diet change program, with six 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. They found the results from the study were 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). They concluded from the study were 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 have suggested intensive yoga program with a change in diet can pose certain risks. Benefits seen were better postural stability, grip strength (though a 'practice effect' was not ruled out), reduced waist and hip circumferences and a decrease in serum leptin levels.

Gordon MM et.al., (2008) determined whether a hypo-caloric diet higher in protein can prevent the loss of lean mass that is commonly associated with weight loss. They compared hypo-caloric diet moderately high in protein to one lower in protein. They were taken study measurements at the Wake Forest University General Clinical Research Center (GCRC) and Geriatric Research Center (GRC). Twenty-four post-menopausal, obese women (mean age = 58 +/- 6.6 yrs; mean BMI = 33.0 +/- 3.6 kg/m²). Two 20-week hypo-caloric diets (both reduced by 2800 kcal/wk) were compared: one maintaining dietary protein intake at 30percent of total energy intake (1.2-1.5 g/kg/d; HI PROT), and the other maintaining dietary protein intake at 15percent of total energy (0.5-0.7 g/kg/d; LO PROT). The GCRC metabolic kitchen provided lunch and dinner meals which the women picked up three days per week and ate outside of the clinic. Body composition, including total body mass, total lean

mass, total fat mass and appendicular lean mass, assessed by dual energy x-ray absorptiometry, and was measured before and after the diet interventions. The HI PROT group lost 8.4 +/- 4.5 kg and the LO PROT group lost 11.4 +/- 3.8 kg of body weight ($p = 0.11$). The mean percentage of total mass lost as lean mass was 17.3percent +/- 27.8percent and 37.5percent +/- 14.6percent, respectively ($p = 0.03$). Maintaining adequate protein intake may reduce lean mass losses associated with voluntary weight loss in older women.

Bopp MJ et.al., (2008) investigated the association between dietary protein intake and loss of lean mass during weight loss in postmenopausal women through a retrospective analysis of a 20-week randomized, controlled diet and exercise intervention in women aged 50 to 70 years. Weight loss was achieved by differing levels of caloric restriction and exercise. The diet-only group reduced caloric intake by 2,800 kcal/week, and the exercise groups reduced caloric intake by 2,400 kcal/week and expended approximately 400 kcal/week through aerobic exercise. Total and appendicular lean mass was measured using dual energy x-ray absorptiometry. Linear regression analysis was used to examine the association between changes in lean mass and appendicular lean mass and dietary protein intake. Average weight loss was 10.8 +/- 4.0 kg, with an average of 32percent of total weight lost as lean mass. Protein intake averaged 0.62 g/kg body weight/day (range=0.47 to 0.8 g/kg body weight/day). Participants who consumed higher amounts of dietary protein lost less lean mass and appendicular lean mass ($r=0.3$, $P=0.01$ and $r=0.41$, $P<0.001$, respectively). These associations remained significant after adjusting for intervention group and body size. Therefore, inadequate protein intake during caloric restriction may be associated with adverse body-composition changes in postmenopausal women.

Daley A et.al., (2006) documented factors associated with the use of complementary medicine and non-pharmacological interventions in symptomatic menopausal women. Determined the prevalence of using CAM and NPI for menopausal symptoms; and describe the perceived effectiveness of CAM and NPI for symptom management; and investigate lifestyle and demographic factors associated with CAM/NPI use among menopausal women with vasomotor symptoms. Women aged 46–55 years were recruited via six socioeconomically diverse general practices.

Participants completed a postal questionnaire that contained items relating to demographics, lifestyle factors, weight, height, exercise behavior, menopausal status, vasomotor symptoms and utilization and perceived effectiveness of a range of CAM/NPI for symptom management. Total of 1206 women who responded, 563 (47percent) were symptomatic. The most commonly used CAM/NPI for symptom management was diet/nutrition (44.3percent), exercise/yoga (41.5percent), relaxation/stress management (27.4percent) and homeopathic/naturopathic remedies (25.4percent). Of women who used these interventions, large proportions reported them to be helpful. The characteristics that were independently associated with use of CAM/NPI were White ethnicity, being physically active, and not smoking. Many menopausal symptomatic women are using a wide range of CAM/NPI and report these to be effective, particularly those who are white, physically active and do not smoke.

Radak TL (2004) did a study on Caloric restriction and calcium's effect on bone metabolism and body composition in overweight and obese premenopausal women. Most studies demonstrate a positive relationship between calcium intake and bone mass. However, during caloric restriction, which is commonly used for weight loss, calcium intake has shown mixed results. Calcium from dairy sources has received additional attention, beyond its importance to bone, for its role in regulating body weight and composition. Dairy foods are perceived as high fat, and therefore, are generally minimized or avoided during caloric restriction. The current calcium intake for premenopausal women is significantly below recommendations, and even if met during caloric restriction, may not be adequate. This review underscores the need for maintaining at least adequate intake levels of calcium, if not more, during weight loss regimens to minimize potential long-term detrimental effects on bone metabolism.

Chen YM et.al., (2004) examined whether the associations between isoflavone supplementation and rates of change in bone mineral content (BMC) could be modified by years since menopause (YSM), body weight (BW), and dietary calcium intake in postmenopausal Chinese women aged 48 to 62 years. A group of 203 eligible women were randomly assigned to three treatment groups: placebo (daily dose of 0 mg isoflavones + 500 mg calcium, n = 67), mid-dose (40 mg isoflavones + 500 mg calcium, n = 68); and high-dose (80 mg isoflavones + 500 mg calcium, n =

68). Bone mineral density (BMD) and BMC at the whole body, spine, and hip were measured by dual-energy x-ray absorptiometry at baseline and post treatment after one year. YSM, BW, and dietary calcium intake stratified analyses were performed to evaluate whether the associations between isoflavones supplementation and BMC change rates were varied with these factors. Both univariate and multivariate analyses observed significant favorable effect of isoflavone supplementation on rates of change in BMC at the total hip and trochanter among later postmenopausal women (> 4 y), in women with lower BW (< or =median, 55.5 kg), or among women with lower level of calcium intake (< or =median, 1095 mg/d). The independent effect of soy on the maintenance of hip BMC is more marked in women in later menopause or those with lower BW or calcium intake.

Ho SC et.al., (2003) reported the results of the baseline cross-sectional analysis of the association between dietary soy protein intake and bone mineral density/content in a population-based study of Chinese women. The sample comprised 454 healthy Chinese women (mean age 55.1 +/- 3.57) within the first 12 years of post menopause. They estimated the dietary intake of soy protein and isoflavones, and other key nutrients, including dietary protein and calcium, using the quantitative food frequency method. Bone mineral density (BMD) and content (BMC) at the spine, hip and total body were measured with a dual energy X-ray densitometer (Hologic 4500A). Soy protein consumption was categorized as quartiles of intake, and related to BMD values at the spine and hip, and BMC of total body. Stratified analyses were carried out among women within or at least four years postmenopausal. They observed few differences in BMD/BMC values among the intake quartiles in women within the first four years of menopause. However, among the later postmenopausal women and noted a dose-response relationship with increasing higher BMD values at the trochanter, intertrochanter as well as the total hip and total body with increasing soy protein intake quartiles ($P < 0.05$ from tests for trend). The BMD values differed by about 4-8percent between the first and fourth soy protein intake quartiles. Though women from the fourth intake quartile had a 2.9percent higher BMD value compared with those from the first intake quartile, the difference was not statistically significant. Step wise multiple linear regression analyses showed the association between soy intake quartiles and hip BMD as well as total body BMC values remained after adjusting for body weight, which was retained in the final model. Analyses based on soy isoflavones content yielded similar results. This study

demonstrated that, among women after the initial few years postmenopausal, soy protein/isoflavones intake had a modest but significant association with hip BMD as well as total body BMC. The effects of soy protein and soy isoflavones on bone health should be further explored in populations with habitual dietary soy intake.

Macdonald H M et.al., (2003) investigated whether energy intake or energy expenditure affects 5–7 y weight gain in perimenopausal and early postmenopausal women, and whether hormone replacement therapy (HRT) use or dietary calcium (Ca) intake are contributory factors. They did a Longitudinal, observational study of healthy women around the menopause. A total of 1064 initially premenopausal women, selected from a random population of 5119 women aged 45–54 y at baseline. In all, 907 women (85.2percent) returned 6.3±0.6 y later for repeat measurements. Of these, 36percent were postmenopausal (no HRT) and 45percent had taken HRT, and 898 women completed the questionnaires. They took measurement on Weight, height, estimation of energy intake by food frequency questionnaire and physical activity level (PAL) by questionnaire. Change in PAL influenced weight change explaining 4.4percent (P=0.001) of the variation. Alterations in dietary energy intake also had a small but significant effect (0.6percent P=0.013). Dietary Ca intake had no effect on weight or weight change. They concluded from the study Mean weight had increased and was influenced more by reduced energy expenditure rather than increased energy intake. HRT and dietary Ca intake did not influence weight gain.

Bunyard LB Dennis KE and Nicklas BJ (2002) determined the specific dietary factors associated with the commonly observed decrease in HDL-C concentration in obese, postmenopausal women placed on a low-fat diet. Dietary intake, lipoprotein lipid concentrations, and body weight were measured before and after 10 weeks of instruction in the principles of the American Heart Association (AHA) Step 1 diet in 55 overweight and obese (body mass index=33+/-4 kg/m²), sedentary, postmenopausal women (mean age 59+/-5 years). The percent of energy obtained from total fat, monounsaturated, polyunsaturated, saturated fat, and dietary cholesterol decreased significantly after dietary intervention, while the poly unsaturated saturated ratio and the percent of energy obtained from total carbohydrate, complex carbohydrate, and simple carbohydrate increased. On average, the women lost a small, but significant, amount of body weight (2percent+/-3percent, P<.0001).

Adherence to the AHA diet reduced total cholesterol (-8percent+/-8percent), LDL-C (-6percent+/-11percent), and HDL-C (-16percent+/-10percent). The only dietary change that predicted decreases in HDL-C concentrations was the increase in the percent of energy from simple sugar ($r=-0.32$, $P<.05$). There were no relationships between changes in HDL-C and changes in percent of energy from fat ($r=0.16$), saturated fat ($r=0.07$), polyunsaturated fat ($r=0.04$), or monounsaturated fat ($r=0.09$). In postmenopausal women, a dietary reduction in total fat, saturated fat, and cholesterol reduces body weight, total cholesterol, and LDL-C, but substitution of simple sugar for dietary fat may lead to a reduction in HDL-C. Further research is needed to determine which specific simple sugars are contributing to diet-induced reductions in HDL-C in older women placed on a low-fat diet.

Chisato Nagata et.al., (2000) conducted a study in Takayama, Gifu, Japan, to evaluate the association between diet and the onset of menopause. A total of 1,130 female residents aged 35–54 years who were premenopausal and completed a validated semi quantitative food frequency questionnaire in 1992 were contacted by mail with a follow-up questionnaire in 1998 to update information on menopause. Onset of menopause was defined as a woman's age at the last menstrual period prior to stopping menstruation for 12 months. During the 6-year study period, 296 women experienced natural menopause. The Cox proportional hazards model was used to estimate hazard ratios of the onset of menopause after controlling for age, total energy, body mass index, years of smoking, and age at which regular menstrual cycle began. They found that green and yellow vegetable intake was significantly inversely associated with the 6-year incidence of menopause (hazard ratio = 0.71, 95percent confidence interval: 0.54, 0.95 for the highest vs. lowest tertile of intake, p for trend = 0.02). Association of carotene intake with the incidence of menopause was of borderline significance (hazard ratio = 0.78, 95percent confidence interval: 0.59, 1.04, = 0.07).

Van Loan and Keim NL (2000) determined whether women with CER had lower total-body BMD and BMC than did other women. Premenopausal women, 90-150percent of ideal weight, had measurements of their BMD and BMC made and completed questionnaires on physical activity, weight history, body size satisfaction, dieting history, eating behavior, and childbearing history. Bone measurements were

examined for differences between groups with low and high CER scores by using analysis of co-variance and quartiles of body weight to adjust for body size differences. CER was assessed by using the Three-Factor Eating Inventory and was defined as a score ≥ 9 ; normal eating restraint (NER) was defined by a score < 9 . Total-body BMC, BMD, and fat and lean masses were measured by dual-energy X-ray absorptiometry. Fifty-two percent of the women were classified as having CER. Women with CER were significantly more dissatisfied with their bodies. Analysis of co-variance, with weight as the covariate, indicated a significant difference in BMC between women in pre-planned pairs from the 5 lowest and 5 highest CER levels. No significant differences in BMD were observed between groups. Significantly lower BMC was found in women with high CER scores and body weights < 71 kg than in those with high CER scores and weights ≥ 71 kg. BMC was significantly different between women with low and high CER scores. BMC was significantly lower in women with body weights < 71 kg and classified with CER. Lower BMC in women with high CER scores may indicate an increased risk of osteoporosis.

Ole Lander Svendsen Christian Hassager and Claus Christiansen (1993)

studied the effect of exercise added to an energy-restrictive diet in overweight postmenopausal women. In a longitudinal clinical study, 121 healthy, overweight postmenopausal women (age 53.8 ± 2.5 years, body mass index: 29.7 ± 3.1 kg/m²) were randomly assigned to 3 groups: controls, a 4,200 kJ/d diet, or a 4,200 kJ/d diet with combined aerobic and anaerobic exercise. Body composition (measured by dual-energy x-ray absorptiometry), fat distribution, resting metabolic rate, blood pressure, serum lipids and lipoproteins, bone mineral densities, and markers of collagen and bone turnover were measured before and after 12 weeks of intervention. One hundred eighteen women completed the study. The mean loss of body weight (9.5 kg versus 10.3 kg, NS) was similar in the intervention groups, but compared with the diet-only group, the diet-plus-exercise group lost more fat (7.8 kg versus 9.6 kg, $p < 0.001$) and no lean tissue mass (1.2 kg versus -0.0 kg, $p < 0.001$). The resting metabolic rate (per kg wt) was increased in the diet-plus-exercise group compared with the control group (11percent versus 4percent, $p < 0.009$). The levels of serum triglycerides, total cholesterol, low-density lipoprotein, and very-low-density lipoprotein decreased, and the ratio of high-density lipoprotein to low-density lipoprotein increased by 20percent to 30percent in both intervention groups compared with the control group ($p < 0.001$).

The systolic blood pressure dropped, and the waist-to-hip circumference ratio and abdominal-to-total body fat decreased in both intervention groups compared with the control group (10percent, $p < 0.003$, and 3.5percent, $p < 0.0001$). There were no consistent, major differences between the groups in terms of changes in total body, spinal, or forearm bone mineral densities, or in markers of collagen and bone turnover. Overweight postmenopausal women benefit from addition of combined aerobic and anaerobic exercise to an energy-restrictive diet. The diet itself has a positive effect on cardiovascular risk factors.

2.5 STUDIES ON HORMONAL VARIABLES IN DIET AND MENOPAUSE

Willemijn AM Van Gemert et.al., (2015) measured effect of weight loss, with or without exercise, on body composition and sex hormones in postmenopausal women, the SHAPE -2 trial. Overweight, insufficiently active women were randomized to a diet ($N = 97$), mainly exercise ($N = 98$) or control group ($N = 48$). The goal of both interventions was to achieve 5–6 kg of weight loss by following a calorie-restricted diet or an intensive exercise programme combined with only a small caloric restriction. Primary outcomes after 16 weeks were serum sex hormones and sex hormone-binding globulin (SHBG). Body fat and lean mass were measured by dual-energy X-ray absorptiometry. Both the diet (–4.9 kg) and mainly exercise (–5.5 kg) groups achieved the target weight loss. Loss of body fat was significantly greater with exercise versus diet (difference –1.4 kg, $P < 0.001$). In the mainly exercise arm, the reduction in free testosterone was statistically significantly greater than that of the diet arm (treatment effect ratio [TER] 0.92, $P = 0.043$), and the results were suggestive of a difference for androstenedione (TER 0.90, $P = 0.064$) and SHBG (TER 1.05, $P = 0.070$). Compared with the control arm, beneficial effects were seen with both interventions, diet and mainly exercise, respectively, on oestradiol (TER 0.86, $P = 0.025$; TER 0.83, $P = 0.007$), free oestradiol (TER 0.80, $P = 0.002$; TER 0.77, $P < 0.001$), SHBG (TER 1.14; TER 1.21, both $P < 0.001$) and free testosterone (TER 0.91, $P = 0.069$; TER = 0.84, $P = 0.001$). After adjustment for changes in body fat, intervention effects attenuated or disappeared. Weight loss with both interventions resulted in favorable effects on serum sex hormones, which have been shown to be associated with a decrease in postmenopausal breast cancer risk. Weight loss induced mainly by exercise additionally resulted in maintenance of lean

mass, greater fitness, greater fat loss and a larger effect on (some) sex hormones. The greater fat loss likely explains the observed larger effects on sex hormones.

Baird D D et.al., (2016) conducted the study on dietary intervention study to assess estrogenicity of dietary soy among postmenopausal women. They tested the hypothesis that postmenopausal women on a soy-supplemented diet show estrogenic responses. Ninety-seven postmenopausal women were randomized to either a group that was provided with soy foods for 4 weeks or a control group that was instructed to eat as usual. Changes in urinary isoflavone concentrations served as a measure of compliance and phytoestrogen dose. Changes in serum FSH, LH, sex hormone binding globulin, and vaginal cytology were measured to assess estrogenic response. The percentage of vaginal superficial cells (indicative of estrogenicity) increased for 19percent of those eating the diet compared with 8percent of controls ($P = 0.06$ when tested by ordinal logistic regression). FSH and LH did not decrease significantly with dietary supplementation as hypothesized, nor did sex hormone binding globulin increase. Little change occurred in endogenous estradiol concentration or body weight during the diet. Women with large increases in urinary isoflavone concentrations were not more likely to show estrogenic responses than were women with more modest increases. On the basis of published estimates of phytoestrogen potency, a 4-week, soy-supplemented diet was expected to have estrogenic effects on the liver and pituitary in postmenopausal women, but estrogenic effects were not seen. At most, there was a small estrogenic effect on vaginal cytology.

Bacon L et.al., (2004) examined the effect of restrained eating on obese women, also examined bone mineral density (BMD) and content (BMC) of the spine and femur in premenopausal chronic dieting obese women who were restrained eaters, with emphasis on the relationship between BMC and determinants of bone mass, and current eating behaviors, dietary intake, physical activity and indices of calcium regulation, bone metabolism, stress and inflammation. A total of 78 obese, Caucasian, female, restrained eaters, ages 30-45 years, were enrolled in a weight loss program. Height, weight, bone turnover markers, serum parathyroid hormone (PTH), cortisol, C-reactive protein (CRP), dietary intake, eating behaviors, physical activity, and BMD and BMC were measured. This study was conducted at the University of California, in Davis, CA, USA. In all, 31percent of women had osteopenia or osteoporosis (OSTEO). In the OSTEO group, 87.5percent of women had osteoporosis or osteopenia of the lumbar spine and 12.5percent of the women had osteoporosis or

osteopenia in femur. A significant positive correlation between BMC and energy expenditure ($r=0.256$), and a significant negative correlation between BMC and number of times on a weight loss diet ($r=-0.250$) and cognitive restraint ($r=-0.239$) were observed. No significant differences were observed between OSTEOPOROTIC women and non-osteoporotic women for current eating behaviors, dietary intake, physical activity habits, bone turnover, calcium regulation, stress, or inflammation. Obese restrained eaters are at risk for low bone mass. Prior dieting may be responsible. Chronic dieters should be encouraged to decrease their dietary restraint, develop healthy eating habits and increase physical activity.

Schaefer EJ et.al., (1995) investigated the effects of a low-fat, high-fiber diet on plasma lipid and lipoprotein levels and serum sex hormone concentrations in 22 normal premenopausal women. Participants consumed a baseline diet for four weeks (40percent of calories as fat, 16percent as saturated fatty acids, 8percent as polyunsaturated fatty acids, 400 mg/d cholesterol, and 12 g/d dietary fiber) and then a low-fat, high-fiber diet for 8 to 10 weeks (16percent to 18percent of calories as fat, 4percent as saturated fatty acids, 4percent as polyunsaturated fatty acids, 150 mg/d cholesterol, and 40 g/d fiber). Blood samples for determination of plasma lipids and serum hormones were obtained during the follicular and luteal phases of the menstrual cycle during both diets. Compared with the baseline diet, the low-fat, high-fiber diet resulted in significant decreases in total cholesterol (TC), low-density lipoprotein (LDL) cholesterol, and high-density lipoprotein (HDL) cholesterol concentrations during both the follicular and luteal phases (TC, -14percent and -16percent; LDL cholesterol, -14percent and -17percent; and HDL cholesterol, -15percent and -18percent, respectively). During the follicular phase but not the luteal phase on the low-fat, high-fiber diet, women exhibited significant increases in plasma triglyceride ([TG] 22percent) and very-low-density lipoprotein (VLDL)-TG (36percent) concentrations. During the follicular phase, serum estrone sulfate concentrations decreased by 25percent ($P < .0001$) when subjects were fed the low-fat, high-fiber diet.

2.6 STUDIES ON PSYCHOLOGICAL VARIABLES IN DIET AND MENOPAUSE

Ikuyo Imayama et.al., (2011) examined the individual and combined effects of dietary weight loss and/or exercise interventions on health related quality of life (HRQOL) and psycho-social factors such as depression, anxiety, stress, social support. Overweight/obese postmenopausal women were randomly assigned to 12 months of dietary weight loss (n = 118), moderate-to-vigorous aerobic exercise (225 minutes/week, n = 117), combined diet and exercise (n = 117), or control (n = 87). Demographic, health and anthropometric information, aerobic fitness, HRQOL (SF-36), stress (Perceived Stress Scale), depression (Brief Symptom Inventory (BSI)-18), anxiety (BSI-18) and social support (Medical Outcome Study Social Support Survey) were assessed at baseline and 12 months. The 12-month changes in HRQOL and psycho-social factors were compared using analysis of co-variance, adjusting for baseline scores. Multiple regression was used to assess predictors of changes in HRQOL. Twelve-month changes in HRQOL and psycho-social factors differed by intervention group. The combined diet plus exercise group improved four aspects of HRQOL (physical functioning, role-physical, vitality, and mental health), and stress ($p \leq 0.01$ vs. controls). The diet group increased vitality score ($p < 0.01$ vs. control), while HRQOL did not change differently in the exercise group compared with controls. However, regardless of intervention group, weight loss predicted increased physical functioning, role-physical, vitality, and mental health, while increased aerobic fitness predicted improved physical functioning. Positive changes in depression, stress, and social support were independently associated with increased HRQOL, after adjusting for changes in weight and aerobic fitness. A combined diet and exercise intervention has positive effects on HRQOL and psychological health, which may be greater than that from exercise or diet alone. Improvements in weight, aerobic fitness and psycho-social factors may mediate intervention effects on HRQOL.

Toobert J Deborah, et.al., (2007) examined long term effects of the Mediterranean lifestyle program: a randomized clinical trial for postmenopausal with type II diabetes. 279 Postmenopausal women with type 2 diabetes participated in the Mediterranean Lifestyle Program (MLP), a randomized, comprehensive lifestyle intervention study. The intervention targeted healthful eating, physical activity, stress

management, smoking cessation, and social support. Outcomes included lifestyle behaviors (i.e., dietary intake, physical activity, stress management, smoking cessation), psycho-social variables (e.g., social support, problem solving, self-efficacy, depression, quality of life), and cost analyses at baseline, and 6, 12, and 24 months. MLP participants showed significant 12- and 24-month improvements in all targeted lifestyle behaviors with one exception (there were too few smokers to analyze tobacco use effects), and in psychosocial measures of use of supportive resources, problem solving, self-efficacy, and quality of life. The MLP was more effective than usual care over 24 months in producing improvements on behavioral and psychosocial outcomes. Directions for future research include replication with other populations.

2.7 STUDIES ON OTHER VARIABLES IN YOGA AND DIET ON MENOPAUSE

Jones SM et.al., (2016) examined the relationship of vasomotor symptoms intensity and heart rate variability, a measure of autonomic nervous system function. Women (n = 282) were recruited from three American states for a clinical trial of yoga, exercise, and omega-3 fatty acid supplements for VMS. To be eligible, women had to report at least 14 VMS per week, with some being moderate to severe. Sitting electrocardiograms were recorded for 15 min using Holter monitors at both baseline and 12-week follow-up. Time and frequency domain HRV measures were calculated. Women completed daily diary measures of VMS frequency and intensity for 2 weeks at baseline and for 1 week at the follow-up assessment 12 weeks later. Multi variable linear regression was used to assess the relationship between VMS and baseline HRV measures and to compare change in HRV with change in VMS over the 12 weeks. Baseline HRV was not associated with either VMS frequency or intensity at baseline. Change in HRV was not associated with change in VMS frequency or intensity across the follow-up. Heart rate variability (HRV) was not associated with basal VMS frequency or intensity in perimenopausal and postmenopausal women experiencing high levels of VMS. Autonomic function may be associated with the onset or presence of VMS, but not with the number or intensity of these symptoms.

SoJung Kim et.al., (2015) examined the effects of a progressive 8-month Ashtanga-based Yoga program on bone turnover markers (BTM), areal bone mineral density (aBMD) and volumetric bone characteristics in premenopausal women. Thirty-four premenopausal women (35-50 years) were randomly assigned either to a Yoga group (YE, n = 16) or a control group (CON, n = 18). Participants in YE group performed 60 minutes of an Ashtanga-based Yoga series 2 times/week with one day between sessions for 8 months, and the session intensity was progressively increased by adding the number of sun salutations (SS). Participants in CON were encouraged to maintain their normal daily lifestyles monitored by the bone specific physical activity questionnaire (BPAQ) at 2 month intervals for 8 months. Body composition was measured by dual energy x-ray absorptiometry (DXA). Bone formation (bone alkaline phosphatase, Bone ALP) and bone resorption (Tartrate-Resistant Acid Phosphatase-5b, TRAP5b) markers were assessed at baseline and after 8 months. aBMD of total body, lumbar spine and dual proximal femur and tibia bone characteristics were measured using DXA and peripheral Quantitative Computed Tomography (pQCT), respectively. They found that the serum Bone ALP concentrations were maintained in YE, but significantly ($p = 0.005$) decreased in CON after the 8 month intervention, and there were significant ($p = 0.002$) group differences in Bone ALP percent changes (YE 9.1 ± 4.0 percent vs. CON -7.1 ± 2.3 percent). No changes in TRAP5b were found in either group. The 8-month Yoga program did not increase aBMD or tibia bone strength variables. Body composition results showed no changes in weight, fat mass, or percent fat, but small significant increases in bone free lean body mass occurred in both groups. The findings of this study suggest that regular long-term Ashtanga Yoga had a small positive effect on bone formation but did not alter aBMD or tibia bone characteristics in premenopausal women.

Guthrie KA et.al., (2015) described the effects of six interventions for menopausal vasomotor symptoms relative to control in a pooled analysis, facilitating translation of the results for clinicians and symptomatic women. The Menopause Strategies: Finding Lasting Answers for Symptoms and Health network tested these interventions in three randomized clinical trials. They used the methods for this study were an analysis of pooled individual-level data from three randomized clinical trials is presented. Participants were 899 perimenopausal and postmenopausal women with

at least 14 bothersome vasomotor symptoms per week. Interventions included 10-20 mg escitalopram per day, non aerobic yoga, aerobic exercise, 1.8 g per day omega-3 fatty acid supplementation, 0.5 mg low-dose oral 17-beta-estradiol (E2) per day, and 75 mg low-dose venlafaxine XR per day. The main outcome measures were changes from baseline in mean daily vasomotor symptom frequency and bother during 8-12 weeks of treatment. Linear regression models estimated differences in outcomes between each intervention and corresponding control group adjusted for baseline characteristics. Models included trial-specific intercepts, effects of the baseline outcome measure, and time. The results of the study were the 8-week reduction in vasomotor symptom frequency from baseline relative to placebo was similar for escitalopram at -1.4 per day (95percent confidence interval [CI] -2.7 to -0.2), low-dose E2 at -2.4 (95percent CI -3.4 to -1.3), and venlafaxine at -1.8 (95percent CI -2.8 to -0.8); vasomotor symptom bother reduction was minimal and did not vary across these three pharmacologic interventions (mean -0.2 to -0.3 relative to placebo). No effects on vasomotor symptom frequency or bother were seen with aerobic exercise, yoga, or omega-3 supplements. They derived the conclusion from the study were escitalopram, low-dose E2, and venlafaxine provide comparable, modest reductions in vasomotor symptom frequency and bother among women with moderate hot flushes.

Baskaran Jayabharathi and Arulappan Judie (2014) did a Prospective Randomized Interventional Study to Evaluate the Effect of Yoga on Quality of Life of Menopausal Women. This study tested the effect of yoga on quality of life of menopausal women. The study was conducted in selected areas in Chennai, Tamilnadu. Simple random sampling technique was used for the study. Of 260 menopausal women, 130 of them were allotted to study group and 130 of them to control group. The study group underwent yoga training and practiced yoga daily for 35-40mints /day for 12 weeks. Standardized WHO QOL BREF Scale was used to assess the menopausal women's quality of life. The result of the study was extremely high significant difference found in all domains of quality of life at $p=0.001$ level between study group and control group at 12 weeks. Conclusion: The study concluded that, yoga is an effective intervention in improving the quality of life of menopausal women.

Woods NF et.al., (2014) studied the effects of mind-body therapies on symptom clusters during the menopausal transition. They reviewed controlled clinical trials of mind-body therapies for hot flushes and at least one other co-occurring symptom from these groups: sleep, cognitive function, mood, and pain. An experienced reference librarian performed an extensive search of PubMed/Medline, CINAHL Plus, PsycInfo, Cochrane Database of Systematic Reviews, Cochrane Central Register of Controlled Trials, Web of Science, EMBASE, AMED, and Alt-Health Watch for randomized controlled trials reported in English between 2004 and July 2011. Of 1193 abstracts identified, 58 trials examining effectiveness of therapies for hot flushes and at least one additional co-occurring symptom of interest were identified. Eight trials (ten publications) examined relaxation, yoga, or exercise. Physical activity/exercise trials (six) yielded mixed results; only one significantly reduced hot flushes and mood symptoms. Of two relaxation therapy trials, only mindfulness-based stress reduction training reduced sleep and mood symptoms and had within-group treatment effects on hot flushes. Yoga (one trial) significantly reduced hot flushes and improved cognitive symptoms more than exercise, and also had within-group effects on sleep and pain symptoms. Studies of mind-body therapies for hot flushes increasingly measure multiple symptom outcomes, but few report treatment effects in ways that allow clinicians to consider symptom clusters when prescribing therapies. Future studies need to measure and report results for individual symptoms or group like symptoms together into subscales rather than use subscales with mixed dimensions. Trials with larger numbers of participants are essential to allow evaluation of these therapies on multiple co-occurring symptoms.

Sapre S and Thakur R (2014) did a literature search using PubMed. The age at natural menopause (ANM) depends on various factors like genetic, environmental, socio- economic, reproductive, dietary, and lifestyle of which some like null parity, vegetarian diet, smoking, high fat intake, cholesterol, and caffeine accelerates; while others like parity, prior use of oral contraceptive pills, and Japanese ethnicity delays the ANM. ANM is an important risk factor for long-term morbidity and mortality; and hence, the need to identify the modifiable risk factors likes diet and lifestyle changes. Delayed menopause is associated with increased risk of endometrial and breast cancer, while early ANM enhances the risk for cardiovascular diseases and osteoporosis. The correlation between diet and ANM has not been extensively

studied; however, whatever studies have been done till now point towards role of high intake of total calories, fruits, and proteins in delaying the ANM, while high polyunsaturated fat intake accelerates it. The role of dietary soy, total fat, saturated fat, red meat, and dietary fiber in determining the ANM has been controversial and needs further studies to substantiate it. The lifestyle factors like current smoking and vigorous exercise have been significantly associated with early menopause, while moderate alcohol consumption delays the ANM. Large prospective studies are needed to study the association of ANM and other modifiable factors like passive smoking fish consumption, soy, and various types of tea.

Nancy E Avis et.al., (2014) did a study on the efficacy of yoga for reducing self-reported menopausal hot flashes in a randomized study including an attention control group. They randomized 54 women late perimenopausal (2–12 months of amenorrhea) and postmenopausal women (12 or more months of amenorrhea), aged 45–58 years, with at least 4 hot flashes per day on average, for at least 4 weeks, to one of three groups: yoga, health and wellness education (HW) classes, and a wait list (WL) control group. Yoga and HW classes consisted of weekly 90 minute classes for 10 weeks. All women completed daily hot flash diaries throughout the trial (10 weeks) to track frequency and severity of hot flashes. The mean hot flash index score is based on the number of mild, moderate, severe and very severe hot flashes. Hot flash frequency declined significantly over time for all three groups with the strongest decline during the first week. There was no overall significant difference in hot flash frequency decrease over time by treatment groups, but the yoga and HW groups followed similar patterns and both showed greater decreases than the WL group. By week 10, women in the yoga group reported a decrease of approximately 66percent in hot flash frequency, 63percent in HW, and 36percent in the WL group. The hot flash index showed a similar pattern. They suggested that yoga can serve as a behavioral option for reducing hot flashes, but they also suggest that yoga may not offer any advantage over other types of interventions.

Wu L Ma D Waltan- Moss B and He Z (2014) evaluated the effects of a low-fat diet, in comparison with the participants' usual diet, was conducted according to the guidelines of the Cochrane Handbook for Systematic Reviews of Interventions. All analyses were performed using RevMan version 5 (Cochrane Collaboration). From 512 potentially relevant publication citations reviewed, 8 randomized clinical trials were included in the meta-analysis, representing 22 groups (11 intervention

groups and 11 control groups). A total of 1,536 women (900 in the intervention group and 636 in the control group) met the inclusion criteria. Total cholesterol (TC), high-density lipoprotein cholesterol (HDL-C), and low-density lipoprotein cholesterol (LDL-C) values changed more favorably in participants randomized to low-fat diets than in participants randomized to their usual diets. Low-fat diet was found to induce significant reductions in TC (random-effects model: mean difference [MD], -0.49 mmol/L; 95percent CI, -0.69 to -0.29; I = 42percent; Peffect < 0.00001), HDL-C (MD, -0.12 mmol/L; 95percent CI, -0.20 to -0.05; I = 49percent; Peffect = 0.00006), and LDL-C (MD, -0.24 mmol/L; 95percent CI, -0.38 to -0.09; I = 42percent; Peffect = 0.001) for two groups. For subgroup analysis, low-fat diet was efficacious in reducing TC, HDL-C, and LDL-C in premenopausal women but did not significantly reduce the same outcomes in postmenopausal women. However, there were also no statistically significant differences in triglycerides (TG) and TC-to-HDL-C ratio between a low-fat diet and the participants' usual diet (TG: MD, 0.04 mmol/L; 95percent CI, -0.02 to 0.11; I = 0percent; Peffect = 0.16; TC-to-HDL-C ratio: MD, 0.08 mmol/L; 95percent, CI -0.21 to 0.36; I = 0percent; Peffect = 0.59) in two groups. Overall results suggest that a low-fat diet is efficacious in reducing the concentrations of TC, HDL-C, and LDL-C but not in reducing TG and TC-to-HDL-C ratio in women. A low-fat diet is efficacious in reducing TC, HDL-C, and LDL-C in premenopausal women. Additional studies are needed to further address its effects on postmenopausal women.

Madanmohan et.al., (2012) did a study on effect of yoga therapy on reaction time, biochemical parameters and wellness score of peri and post-menopausal diabetic patients. They used the methods and methodology for the study were 15 peri and post-menopausal patients receiving standard medical treatment for type II diabetes Mellitus were recruited and reaction time and biochemical investigations were done before and after a comprehensive yoga therapy program comprising of three times a week sessions for six weeks. A post-intervention, retrospective wellness questionnaire compiled by ACYTER was used to evaluate the comparative feelings of the patients after the therapy program. They found the results from the study were Yoga training reduced auditory reaction time (ART) from right as well as left hand, the decrease being statistically significant ($P < 0.05$) for ART from the right hand. There was a significant ($P < 0.01$) decrease in fasting and postprandial blood glucose levels as well as low density lipoprotein. The decrease in total cholesterol, triglycerides, and very

low density lipoprotein and increase in high density lipoprotein was also statistically significant ($P < 0.05$). All the lipid ratios showed desirable improvement with a decrease ($P < 0.01$) of TC/HDL and LDL/HDL ratios and increase ($P < 0.05$) in the HDL/LDL ratio. The conclusions from the study were yoga improved the „heart friendly“ status of lipid profile in the subjects and as the participants were peri and post-menopausal, the decrease in cardiovascular risk profile is of greater significance. A comprehensive yoga therapy program has the potential to enhance the beneficial effects of standard medical management of diabetes mellitus and can be used as an effective complementary or integrative therapy program.

Tuzun S et.al., (2010) evaluated the effect of yoga exercises in postmenopausal osteoporotic women on balance and life quality and to compare the results with a classic osteoporosis exercise program. Twenty-six postmenopausal osteoporotic women over 55 years of age were included in the study. A neuromuscular test battery and the quality index were used for the assessment of balance and life quality, respectively. The results showed that yoga education has a positive effect on pain, physical functions, and social functions, general. Yoga appears to be an alternative physical activity for the rehabilitation of osteoporotic subjects.

Alastair H MacLennan (2009) conducted a study on evidence-based review of therapies at the menopause. The highest level of scientific evidence available for each therapy for menopausal symptoms was sought, for example, systematic reviews of randomised controlled trials. There is reasonable evidence that some symptoms are modified by lifestyle, for example, cessation of smoking, exercise, reduction of alcohol, diet and alleviation of psycho-social stress.

Judith Balk et.al., (2009) conducted a small feasibility pilot study with a prospective, pre-post design comparing markers of bone turnover before and after Yoga training in sedentary osteopenic postmenopausal women. Markers of bone formation were measured with serum bone-specific alkaline phosphatase (BAP). Measures of bone resorption were measured with urinary type I collagen cross-linked N-telopeptide (uNTX). Seven participants completed a 12-week series of one hour per week Yoga classes, in addition to home Yoga practice. They analyzed the correlation between time spent on Yoga and time spent on other weight-bearing exercise and change in bone turnover markers. The amount of Yoga practice was significantly

correlated with BAP levels ($r = 0.68$, $p = 0.09$). A weaker, non-significant correlation was found between the amount of Yoga practice and uNTX levels ($r = -.54$, $p = .21$). Compared to Yoga, other physical activities were less correlated with BAP and uNTX levels. Yoga may have beneficial effects on bone turnover in osteopenic postmenopausal women.

Phoosuvan M Kritpet T and Yuktanandana P (2009) studied the effects of weight bearing yoga training on the bone resorption markers of the postmenopausal women. The samples were recruited by the purposive sampling from the female Chulalongkorn University staff aged between 50-60 years. The subjects were divided into two groups: experimental group and control group. The baseline demographic data, the bone resorption marker (beta-CrossLaps), the bone formation marker (PINP) and quality of Life (SF-36) data were collected. The experimental group attended the 12-week weight-bearing yoga training three days a week, 50 minutes a day while the control group lived their normal lives. After 12th week, the data collections were repeated in both groups. The experimental group (19 subjects, the mean age 54.320 yrs) and the control group (14 subjects, the mean age 54.430 yrs) were recruited. The mean ultrasound BMD of both heels in both groups showed no osteopenia or osteoporosis. After the 12-week training, the mean bone resorption marker (beta-CrossLaps) of the experimental group reduced from 0.464 to 0.339 ng/ml (-26.939percent) whereas the control group reduced from 0.389 to 0.386 ng/ml (-0.771percent). There was a significant difference ($p < 0.05$). The mean of the bone formation markers (PINP) in the experimental group reduced from 55.393 to 42.401 ng/ml (-23.454percent) and the bone formation markers (PINP) in the control group reduced from 61.903 to 44.832 ng/ml (-27.577percent). In the area of the life quality measurement of both groups, the data obtained from the medical outcomes study short-form survey (SF-36) showed that there were significant differences at 0.05 levels for the physical functioning, bodily pain, general health, and vitality. The variance of percentage change value of the experimental group increased to +25.299, +16.565, +15.309, and +21.056. The variance of percentage change value of the control group increased to +12.946, -1.221, -9.303 and +2.291. The weigh-bearing yoga training had a positive effect on bone by slowing down bone resorption which was a very essential indicator for human health because it reduced the osteoporosis risks in the postmenopausal women. Additionally, yoga training promoted better quality of life.

James W Carson et.al., (2009) evaluated the effects of a yoga intervention on menopausal symptoms in a sample of survivors of early-stage breast cancer (stages IA–IIB). Thirty-seven disease-free women experiencing hot flashes were randomized to the eight-week Yoga of Awareness program (gentle yoga poses, meditation, and breathing exercises) or to wait-list control. The primary outcome was daily reports of hot flashes collected at baseline, post treatment, and three months after treatment via an interactive telephone system. Data were analyzed by intention to treat. At post treatment, women who received the yoga program showed significantly greater improvements relative to the control condition in hot-flash frequency, severity, and total scores and in levels of joint pain, fatigue, sleep disturbance, symptom-related bother, and vigor. At three months follow-up, patients maintained their treatment gains in hot flashes, joint pain, fatigue, symptom-related bother, and vigor and showed additional significant gains in negative mood, relaxation, and acceptance. This pilot study provides promising support for the beneficial effects of a comprehensive yoga program for hot flashes and other menopausal symptoms in early-stage breast cancer survivors.

Rashmi Vyas et.al., (2008) did a pilot study on normal Indian women to see if the raja yoga meditation had an effect on their lipid profile. This pilot study was conducted on 49 normal female volunteers. All were vegetarians and led a sedentary lifestyle. There was no history of hypertension or diabetes mellitus. None of them were smokers and gave no history of alcohol intake. The volunteers were divided into pre-menopausal women (n=23) and postmenopausal women (n=26). They were further divided into three groups: non meditators (seven pre-menopausal women and eight post-menopausal women), short term meditators (meditating for six months to five years; n=8 in the premenopausal women and n=9 in the post-menopausal women) and long term meditators (meditating for more than five years; eight pre-menopausal women and nine post-menopausal women). The non-meditators were a mixed group of staff and students of B.J. Medical College and Civil hospital, Ahmadabad, Gujarat, India who had never done any kind of meditation. The meditators were practicing raja yoga meditation for one hour every morning (7:30 A.M.-8:30 A.M.) at the local Brahmakumari centre, Ahmedabad, Gujarat, India. In raja yoga meditation the individual sat in a relaxed and comfortable position and then used visual or auditory images for concentration. Whenever the mind wandered away, it was to be brought back to the visual or auditory image being used quietly and persistently. Lipid profile

was assessed as described earlier. One-way analysis of variance (ANOVA) were applied to find the significance of differences between the three groups in both the pre and the post-menopausal women. In addition, the groups significantly different at 0.05 level by ANOVA were subjected to Bonferroni multiple comparisons procedure. Comparison between the pre-menopausal and post-menopausal women in all the three groups was done using independent sample "t" test and „P“ less than 0.05 were taken as significant. They found the results were the lipid profile of non-meditators, short-term meditators and long-term meditators in pre and post-menopausal women. Serum cholesterol (P=0.01), serum triglyceride (P=0.04) and LDL-C (P=0.03) were significantly more in non- meditators in the post-menopausal women when compared to those in pre-menopausal women (independent sample t test). High density lipoprotein-C (HDL-C) did not show any significant change. In pre-menopausal women there was no significant difference in the lipid profile among the three groups. In the post-menopausal women, both short and long-term meditators showed a significant lowering of serum cholesterol and LDL-C as compared to non-meditators. Serum triglyceride and HDL-C showed no significant change. There was no significant change in the lipid profile in short-term meditators between the pre and post-menopausal women. Neither was there any significant difference in lipid profile in long-term meditators between pre and post-menopausal women. Their pilot study indicated that raja yoga meditation has the potential of conferring benefits to cardiovascular system by improving the lipid profile in post- menopausal women.

Dorigochoo T et.al., (2008) evaluated the impact of dietary, lifestyle and reproductive factors on age at natural menopause and reproductive span in Chinese women. Study participants were Chinese women aged 40 to 70 who experienced natural menopause and participated in a population-based, prospective study, the Shanghai Women's Health Study (N = 33,054). Dietary intake at the baseline survey was assessed by food-frequency questionnaire. Regression (beta) coefficients, calculated by multivariable linear regression, were used to estimate the effects of dietary, lifestyle, and reproductive patterns on age at menopause and the number of reproductive years, adjusting for potential confounding factors. Early menarche, younger age at first live birth, older age at last live birth, longer duration of breast-feeding, and higher parity were associated with longer reproductive years (Ptrend < 0.01 for all). Higher body mass index at age 20, mid-life weight gain, and leisure-time

physical activity during adolescence and adulthood predicted later menopause and longer reproductive span ($P_{\text{trend}} < 0.01$ for all). Total intake of calories, fruits, and protein was positively associated with later menopause ($P_{\text{trend}} < 0.05$ for all) and longer reproductive span ($P_{\text{trend}} < 0.05$), except for carbohydrates ($P_{\text{trend}} = 0.06$), and long-term tea consumption predicted longer reproductive span ($P_{\text{trend}} = 0.03$). Vegetable, fat, soy, and fiber intakes did not significantly affect reproductive span or age at menopause. Smoking was inversely associated with both early age at menopause and shorter reproductive span ($P_{\text{trend}} < 0.01$). In addition to reproductive factors, intake of fruits and protein, smoking, tea consumption, lifetime patterns of physical activity, and weight gain influenced the onset of menopause and/or reproductive span in Chinese women.

Cohen, et.al., (2007) conducted a study on feasibility and acceptability of restorative yoga for treatment of hot flushes in post-menopausal women. Fourteen post-menopausal women (mean age 58) experiencing moderate to severe hot flushes participated in an 8- week yoga intervention designed and taught by two certified yoga instructors with “extensive experience working with peri and post-menopausal women.” Participants first attended a 3- hour workshop that introduced eight postures: balasana, adho mukha svanasana, baddha konasana, upavistha konasana, viparita karani, setu bandha sarvangasana, supta baddha konasana and savasana. The women then attended eight weekly 90-minute yoga classes and were asked to practice at home for 1 hour at least three times per week. Participants practiced at home for an average of 170 minutes per week. At a 3- month follow-up, 75percent of participants reported continuing to practice the yoga poses they had learned in the intervention; 44percent went on to learn new poses. Result shown that the participants experienced on average a 31percent reduction in hot flush frequency and a 34percent reduction in hot flush severity, from baseline to week 8. This pilot trial demonstrated that it is feasible to teach restorative yoga to middle-aged women without prior yoga experience. The high rates of subject retention and satisfaction suggest that yoga is an acceptable intervention in this population. Our results indicate that a larger, randomized controlled trial to explore the efficacy of restorative yoga for treatment of menopausal symptoms would be safe and feasible.

Ramesh Manocha, Barbara Semmar and Deborah Black (2007) adopted an AB case series design with a follow-up phase. Fourteen women who were

experiencing hot flashes and other menopausal symptoms and receiving no treatment for them attended meditation classes twice weekly for 8 weeks and practiced daily at home. A mental silence orientated technique of meditation called Sahaja Yoga (SYM) was taught. The Hot Flash Diary, Kupperman Index, MENQOL, Greene's Climacteric Scale and STAI, were administered at baseline, mid treatment (4 weeks), post-treatment (8 weeks) and at 8 weeks follow-up. Substantial improvements in all measures occurred at post treatment. Changes in vasomotor symptoms, especially hot flashes, were most prominent as a significant decrease of 67percent at post-treatment and 57percent at follow-up ($\chi^2 = 11.7$, $p < .003$) were noted and Kupperman's Index score decreased by 58percent at post-treatment and 40percent at follow-up ($\chi^2 = 11.7$, $p < .005$). All other symptom measures improved substantially from baseline to post-treatment, non-parametric analysis indicating that most of these changes were significant. These findings tentatively suggest that menopausal symptoms, especially vasomotor symptoms, and particularly hot flashes, might be substantially improved by using meditation.

Sharon Dormire and Chularat Howharn (2007) described the relation between dietary intake and menopausal hot flashes. They have reported two studies: a controlled, repeated-measures study and a descriptive study. The controlled study was conducted in a general clinical research center of a large Midwestern university. The descriptive study was conducted in a metropolitan community in the Southwest. Ten healthy symptomatic postmenopausal women participated in the controlled study and 21 symptomatic women completed the observational study. The controlled study included a 30-hour intensive blood sampling protocol of two sequential experimental phases with an observational phase between them. In the observational phase, each participant served protocol-specific meals and snacks at predetermined times. Skin conductance monitoring provided continual assessment while blood glucose levels were analyzed every 30 minutes in the controlled study. Eating provided a hot flash-free period that averaged 90 minutes in both studies. Also, hot flash frequency increased as time between meals increased. They indicated that hot flash frequency is suppressed after eating, while hot flashes are experienced when blood glucose falls between meals. Nursing interventions aimed at maintaining stability in blood glucose level may be effective in reducing menopausal hot flashes.

Nagel G et.al., (2005) studied the influence of reproductive and dietary factors on the age at menopause for 5.8 years follow-up of the European Prospective Investigation into Cancer and Nutrition (EPIC) cohort in Heidelberg, 1009 women experienced natural menopause. They were compared to 3798 women who did not experience menopause. Baseline dietary intake was obtained by means of validated food frequency questionnaires. Data on reproductive history and medication was collected by means of questionnaires. Cox' proportional hazard models were applied in order to identify determinants of the age at natural menopause. Increasing age at first full term pregnancy and a longer time interval until occurrences of regular menses are associated with later onset of natural menopause. Compared to never smokers, current smokers have the risk of younger age at menopause. High carbohydrate consumption and high intake of vegetable, fiber and cereal products are inversely related to the age at natural menopause. Women with higher intake of total fat, protein and meat experienced a delayed onset of natural menopause. Age at natural menopause is influenced by lifestyle and dietary factors. Further studies including biological markers are needed to clarify these associations.

West SG et.al., (2005) tested whether adding soy protein to a low-fat, high-fiber, Step I diet improved cardiac risk markers in 18 postmenopausal women and 14 men with hypercholesterolemia and examined whether concurrent use of HRT altered diet responsiveness. Diets were matched for macronutrient content, and all food was provided. After 3 weeks on the Step I diet, subjects were randomized to diets (6 weeks) containing 25 g/day protein isolates from soy or cow's milk, with crossover. The soy treatment contained 90 mg/day isoflavones. Lipids, vascular cell adhesion molecule-1 (VCAM-1), p-selectin, and urinary isoflavonoids were measured at the end of each diet. In men and HRT- women only, there were significant reductions in LDL-C (-17.3percent), high-density lipoprotein cholesterol (HDL-C) (-15.3percent), and triglycerides (-11.5percent) during the Step I diet, and soy had no additional effects. At study entry, HRT+ women had lower LDL-C and higher triglycerides than men. Their LDL-C was unchanged, and triglycerides were significantly reduced (-15.1percent) by the Step I diets. Isoflavonoid excretion was unrelated to diet response or HRT status. In men and HRT- women, the diets significantly lowered LDL-C, independent of soy intake. In HRT+ women, the diets improved triglycerides without lowering HDL-C.

Glenn T Gerhard et.al., (2000) compared the effect of diet on fasting plasma lipids and lipoproteins and postprandial lipemia in premenopausal. 13 African American and nine white healthy premenopausal women were fed a low-fat, high-fiber diet and a high-fat, low-fiber diet for four weeks each in a randomized crossover design. Fasting plasma lipid and lipoprotein concentrations and the 24-hours plasma triacylglycerol response to a standard fatty test meal were measured at the end of each dietary period. Plasma total and LDL-cholesterol concentrations were higher after the high-fat, low-fiber diet in both white and African American women ($P < 0.0001$). The 24-h area under the plasma triacylglycerol curve after the test meal was lower after the low-fat diet than after the high-fat diet ($P < 0.04$). They derived the conclusion from the study were African American and white women had lower fasting plasma total and LDL-cholesterol concentrations and less postprandial lipemia after the low-fat than the high-fat diet. Diets low in total and saturated fat and cholesterol and high in fiber may reduce the risk of CHD by lowering fasting plasma total and LDL-cholesterol concentrations and by reducing the lipemic response to fatty meals.

Barnard ND et.al., (2000) conducted a study on effectiveness of a low-fat vegetarian diet in altering serum lipids in healthy premenopausal women. They tested the hypothesis that a low-fat, vegetarian diet significantly reduces serum total and low-density lipoprotein (LDL) cholesterol concentrations in premenopausal women. In a crossover design, 35 women, aged 22 to 48, followed a low-fat vegetarian diet deriving approximately ten percent of energy from fat for two menstrual cycles. For two additional cycles, they followed their customary diet while also taking a supplement pill. Serum lipid concentrations were assessed at baseline and during each intervention phase. Mean serum LDL, high-density lipoprotein (HDL), and total cholesterol concentrations decreased 16.9 percent, 16.5 percent, and 13.2 percent, respectively, from baseline to the intervention diet phase ($p < 0.001$), whereas mean serum triacylglycerol concentration increased 18.7 percent ($p < 0.01$). LDL/HDL ratio remained unchanged. Conclusion of the study was a low-fat vegetarian diet led to rapid and sizable reductions in serum total, LDL, and HDL cholesterol concentrations in healthy premenopausal women.

Marcia L Stefanick et.al., (1998) studied the effect of diet and exercise in men and menopausal women with low levels of HDL Cholesterol and High levels of LDL Cholesterol. They studied plasma lipoprotein levels in 180 postmenopausal women, 45 through 64 years of age, and 197 men, 30 through 64 years of age, who

had low high-density lipoprotein (HDL) cholesterol levels (≤ 59 mg per deciliter in women and ≤ 44 mg per deciliter in men) and moderately elevated levels of low-density lipoprotein (LDL) cholesterol (>125 mg per deciliter but <210 mg per deciliter in women and >125 mg per deciliter but <190 mg per deciliter in men). The subjects were randomly assigned to aerobic exercise, the NCEP Step 2 diet, or diet plus exercise, or to a control group, which received no intervention. The results of the study were dietary intake of fat and cholesterol decreased during the one-year study ($P<0.001$), as did body weight, in women and men in either the diet group or the diet-plus-exercise group, as compared with the controls ($P<0.001$) and the exercise group ($P<0.05$), in which dietary intake and body weight were unchanged. Changes in HDL cholesterol and triglyceride levels and the ratio of total to HDL cholesterol did not differ significantly among the treatment groups, for subjects of either sex. The serum level of LDL cholesterol was significantly reduced among women (a decrease of 14.5 ± 22.2 mg per deciliter) and men (a decrease of 20.0 ± 17.3 mg per deciliter) in the diet-plus-exercise group, as compared with the control group (women had a decrease of 2.5 ± 16.6 mg per deciliter, $P<0.05$; men had a decrease of 4.6 ± 21.1 mg per deciliter, $P<0.001$). The reduction in LDL cholesterol in men in the diet-plus-exercise group was also significant as compared with that among the men in the exercise group (3.6 ± 18.8 mg per deciliter, $P<0.001$). In contrast, changes in LDL cholesterol levels were not significant among the women (a decrease of 7.3 ± 18.9 mg per deciliter) or the men (10.8 ± 18.8 mg per deciliter) in the diet group, as compared with the controls. The conclusions from the study were the NCEP Step 2 diet failed to lower LDL cholesterol levels in men or women with high-risk lipoprotein levels who did not engage in aerobic exercise. This finding highlights the importance of physical activity in the treatment of elevated LDL cholesterol levels.

Lawrence H Kushi, et.al., (1996) examined dietary Antioxidant Vitamins and Death from Coronary Heart Disease in Postmenopausal Women. They studied 34,486 postmenopausal women with no cardiovascular disease who in early 1986 completed a questionnaire that assessed, among other factors, their intake of vitamins A, E, and C from food sources and supplements. During approximately seven years of follow-up, 242 of the women died of coronary heart disease. In analyses adjusted for age and dietary energy intake, vitamin E consumption appeared to be inversely associated with the risk of death from coronary heart disease. This association was particularly striking in the subgroup of 21,809 women who did not consume vitamin supplements

(relative risks from lowest to highest quintile of vitamin E intake, 1.0, 0.68, 0.71, 0.42, and 0.42; P for trend = 0.008). After adjustment for possible confounding variables, this inverse association remained (relative risks from lowest to highest quintile, 1.0, 0.70, 0.76, 0.32, and 0.38; P for trend = 0.004). There was little evidence that the intake of vitamin E from supplements was associated with a decreased risk of death from coronary heart disease, but the effects of high-dose supplementation and the duration of supplement use could not be definitively addressed. Intake of vitamins A and C did not appear to be associated with the risk of death from coronary heart disease. These results suggested that in postmenopausal women the intake of vitamin E from food is inversely associated with the risk of death from coronary heart disease and that such women can lower their risk without using vitamin supplements. By contrast, the intake of vitamins A and C was not associated with lower risks of dying from coronary disease.

Denke MA (1994) did a study on individual responsiveness to a cholesterol-lowering diet in postmenopausal women with moderate hypercholesterolemia. The efficacy of the step one diet in outpatient women with hypercholesterolemia has been debated. Forty-one normotriglyceridemic women whose low-density lipoprotein (LDL) cholesterol levels were 3.62 to 5.17 mmol/L (140 to 200 mg/dL) participated in a two-period outpatient diet counseling study that used a one month high-fat, high-saturated fatty acid period (Hi-Sat diet) and a four-month low-fat, low-saturated fatty acid period (step 1 diet). All women were postmenopausal and were not taking hormone replacement therapy. Levels of lipids, lipoproteins, and plasma triglyceride fatty acids were measured five times during the last two weeks of each dietary period. Dietary intake was assessed by 7-day food records. The mean reduction in total cholesterol level achieved by the step 1 diet was 0.36 mmol/L (14 mg/dL). The reduction in total cholesterol level was seen in both LDL cholesterol levels (0.28 mmol/L (11 mg/dL); $P < .005$) and high-density lipoprotein cholesterol levels (0.08 mmol/L (3 mg/dL); $P = .08$). Although individual LDL responsiveness to diet was normally distributed, there was marked variation in response, which could be explained only partially by compliance (change in saturated fat intake, 10percent), change in body weight (3percent), and an interaction between the palmitic acid content of the plasma and body weight (3percent). A step one diet lowers total and LDL cholesterol levels in postmenopausal women. A non-significant reduction in

high-density lipoprotein cholesterol levels was also observed. Since some women achieved LDL cholesterol levels low enough to obviate the need for drug therapy as primary prevention of coronary heart disease, dietary therapy should remain the first step in the management of hypercholesterolemia in postmenopausal women.

2.8 STUDIES ON SELECTED VARIABLES IN YOGA AND WOMEN

Chandrasekaran MR and Duraisami V (2016) studied the effect of yogic practices on selected physiological variable pulse rate and psychological variable stress among female geriatric people. The study was conducted on 40 geriatric people in totally two groups, namely, control & experimental group. Experimental group consisted of 15 geriatric people. They underwent eight weeks practice in Pavanamuktasana series, Asana, Pranayama, Meditation and Relaxation whereas the control group did not undergo any type of training. Physiological and psychological variables were measured before and after the experimentation using the standardized tests and standard/modified questionnaires. Analysis of Covariance (ANCOVA) analyzed the data and it was concluded that the Pavanamuktasana series, Asana, Pranayama, Meditation and Relaxation had significant of ($P < 0.05$) effect on physiological variable pulse rate and psychological variable stress among geriatric women.

Sangeetha U S (2016) studied the effect of yogic practices with diet modification and the effect of Yogic practices without diet modification on selected physiological variables blood pressure, pulse rate and BMI and psychological variables adjustment anxiety and self-confidence among aged women. 45 aged women from Thanjavur, Tamil Nadu, were randomly selected as subjects and their age was between 65 years and 70 years and assigned into three groups randomly. The pre-test was conducted on the subjects before administrating the training. Yogic practices with diet modification were advocated to Experimental Group-1. Yogic practices without diet modification were advocated to Experimental Group-2. The training was given for a period of eight weeks. No training was given to the Control Group kept in active rest. At the end of the eight week, post-test was conducted on the subjects to conclude the effect of the training. The data collected from all three groups were analyzed and mean differences were tested for by Analysis of Co-Variance (ANCOVA) and Scheffe's Post Hoc test, and the hypotheses were accepted at 0.05

level of significance. Results were yogic practices with diet modification and yogic practices without diet modification decreased BMI, stabilized Systolic Blood Pressure, decreased Pulse Rate, improved Adjustment, reduced Anxiety, and improved Self-confidence, than the Control Group among aged women. And also yogic practices with diet modification was slightly effective than Yogic Practices without diet modification in decreasing BMI, stabilizing Systolic Blood Pressure, decreasing Pulse Rate, improving Adjustment, reducing Anxiety, and improving Self-confidence among aged women.

Parco MSiu et.al., (2015) examined the effect of one year of yoga exercise on the cardiovascular risk factors including central obesity, hypertension, dyslipidemia and hyperglycemia in middle aged and older Hong Kong Chinese adults with Metabolic Syndrome. Adults diagnosed with Metabolic Syndrome using National Cholesterol Program criteria ($n = 182$; mean \pm SD age = 56 ± 9.1) were randomly assigned to a one year yoga intervention group or control group. Systolic and diastolic blood pressure, waist circumference, fasting plasma glucose, triglycerides, and high density lipoprotein cholesterol were examined at baseline, midway and on completion of the study. Physical activity level and caloric intake were assessed and included in the co-variate analysis. A reduction of the number of diagnostic components for Metabolic Syndrome was found to be associated with the yoga intervention. A trend towards a decrease in systolic blood pressure was observed following yoga intervention. These results suggested that yoga.

Mooventhan A and Khode V (2014) evaluated the effect of only Bhramari pranayama and OM chanting on pulmonary function in healthy individuals. A total of 82 subjects were randomized into the study group (SG) ($n = 41$) and control group (CG) ($n = 41$). Baseline assessment was performed before intervention for both groups. SG practiced Bhramari pranayama and OM chanting for the duration of 10 min (5 min for each practice)/day for the period of 6 days/week for 2 weeks and CG did not practice so. After intervention post-assessment was performed for SG ($n = 40$) and CG ($n = 39$). Statistical analysis was performed by Independent samples t-test and Student's paired t-test with the use of Statistical Package for the Social Sciences version 16. They found the result significant improvement in peak expiratory flow (PEF), forced expiratory flow (FEF) 25 percent and maximal voluntary ventilation (MVV) along with a significant reduction in weight in SG compared with CG in independent samples t-test. Significant improvement in slow vital capacity (SVC),

forced expired volume in one (FEV1) along with PEF, FEF 25 percent and MVV; Significant reduction in weight and body mass index were observed in SG unlike in CG in Student's paired t-test. No significant changes were found in forced vital capacity, FEV1 /SVC and FEF50 percent, between and within the group analysis of SG and CG. They derived the conclusion from the study was Bhramari pranayama and OM chanting are effective in improving pulmonary function in healthy individuals.

Rioux JG and Ritenbaugh C (2013) summarized the studies research designs and evaluated the efficacy of yoga for weight loss via the current evidence base. The research team evaluated published studies to determine the appropriateness of research designs, comparability of programs' intervention elements, and standardization of outcome measures. The research team's literature search used the key terms yoga and obesity or yoga and weight loss in three primary medical-literature databases. The research team reviewed each study to determine its key features, each worth a specified number of points, with a maximum total of 20 points. The features included a study's duration, frequency of yoga practice, intensity of each practice, number of yogic elements, inclusion of dietary modification, inclusion of a residential component, the number of weight-related outcome measures, and a discussion of the details of the yogic elements. Overall, therapeutic yoga programs are frequently effective in promoting weight loss and/or improvements in body composition. The effectiveness of yoga for weight loss is related to the key features included an increased frequency of practice, a longer intervention duration, a yogic dietary component, a residential component, the comprehensive inclusion of yogic components, and a home-practice component. Yoga appears to be an appropriate and potentially successful intervention for weight maintenance, prevention of obesity, and risk reduction for diseases in which obesity plays a significant causal role.

Shim C S et.al., (2012) did a study on effects of a yoga-focused prenatal program on stress, anxiety, self-confidence and labor pain in pregnant women with in vitro fertilization treatment. A quasi experimental study with a non-equivalent Control Group pre test - post test design was used. The data collection period and meditation program were between January 9 and August 31, 2009. Forty-six women who were pregnant following IVF, and were between 12–20 weeks gestation, participated in the study (23 experimental group, 23 control group). Data were analyzed using Chi-square test, Mann-Whitney U Test, ANCOVA, and Cronbach's alpha coefficients

with the SPSS 12.0 for Windows Program. Although the sample size was limited, women who participated in the program showed statistically significant improvements in stress, anxiety, labor pain, and self-confidence for women pregnant after IVF. The result indicate that this 12-week Yoga-focused educational program can be utilized for women pregnant following IVF to reduce their stress, anxiety, and labor pain, and to increase delivery confidence. It is suggested that the Yoga-focused educational program be offered to every pregnant woman.

Moliver N et.al., (2011) examined the extent to which body mass index and medication use in a sample of female yoga practitioners over 45 years varied according to the length and frequency of yoga practice. They administered online surveys to 211 female yoga practitioners aged 45 to 80 years. They used regression analyses to evaluate the relationship of extent of yoga experience to both body mass index and medication use after accounting for age and lifestyle factors. They also conducted comparisons with 182 matched controls. Participants had practiced yoga for as long as 50 years and for up to 28 hours per week. There were significant inverse relationships between yoga experience and both body mass index and medication load. These significant relationships remained after accounting for age and lifestyle factors. When they computed yoga experience in terms of total calendar years, without accounting for hours of practice, significant relationships did not remain. However, there was no obesity in the 49 participants with more than 25 years of yoga practice. Yoga practitioners were less likely than non-practitioners to use medication for metabolic syndrome, mood disorders, inflammation, and pain. A long-term yoga practice was associated with little or no obesity in a non-probability sample of women over 45 years. Relationships showed a dose-response effect, with increased yoga experience predicting lower BMI and reduced medication use.

Jennifer Daubenmier et.al., (2011) investigated the psychological distress and elevated cortisol secretion promotes abdominal fat, a feature of the Metabolic Syndrome. Forty-seven overweight/obese women (mean BMI = 31.2) were randomly assigned to a four-month intervention or wait list group to explore effects of a mindfulness program for stress eating. They assessed mindfulness, psychological distress, eating behavior, weight, cortisol awakening response (CAR), and abdominal fat (by dual-energy X-ray absorptiometry) pre- and post-treatment. Treatment participants improved in mindfulness, anxiety, and external-based eating compared to

control participants. Groups did not differ on average CAR, weight, or abdominal fat over time. However, obese treatment participants showed significant reductions in CAR and maintained body weight, while obese control participants had stable CAR and gained weight. Improvements in mindfulness, chronic stress, and CAR were associated with reductions in abdominal fat. This proof of concept study suggested that mindfulness training shows promise for improving eating patterns and the CAR, which may reduce abdominal fat over time.

Anjaladevi M (2011) investigated the effect of varied yogic practices on selected physiological and psychological variables among women insomnia patients. 90 women insomnia patients were selected from Chennai city. They were selected as subjects on randomly aged between 40-65 years and then given training to the experimental groups for the period of six weeks. The pretests were taken from the subjects before administering the training. The subjects were involved with their respective practices on five days in a week. The control group did not participate in any of practices. At the end of the six weeks practices posttest were taken on selected variables for the study on blood pressure, heart rate, respiratory rate, breath holding time, stress, anxiety, depression and self-confidence were considered as the effect of varied yogic practices among insomnia patients. Analysis of Co-variance (ANACOVA) post hoc test was used to find out whether the mean differences were significant or not. The results proved that there was significant improvement in physiological blood pressure, heart rate, respiratory rate and breath holding time and psychological variables stress, depression, anxiety and self-confidence due to six weeks yogic practices.

Rao M Raghavendra (2009) compared the effects of an integrated yoga program with brief supportive therapy in breast cancer outpatients undergoing adjuvant radiotherapy at a cancer center. Eighty-eight stage II and III breast cancer outpatients were randomly assigned to receive yoga (n = 44) or brief supportive therapy (n = 44) prior to radiotherapy treatment. Assessments included diurnal salivary cortisol levels three days before and after radiotherapy and self-ratings of anxiety, depression, and stress collected before and after six weeks of radiotherapy. Analysis of Co-variance reveals significant decreases in anxiety ($P < .001$), depression ($P = .002$), perceived stress ($P < .001$), 6 a.m. salivary cortisol ($P =$

.009), and pooled mean cortisol ($P = .03$) in the yoga group compared with controls. There is a significant positive correlation between morning salivary cortisol level and anxiety and depression. Yoga might have a role in managing self-reported psychological distress and modulating circadian patterns of stress hormones in early breast cancer patients undergoing adjuvant radiotherapy.

Min Sung Ha et.al., (2005) analyzed the effects of yoga exercise on maximum oxygen uptake, cortisol level, and creatinine kinase myocardial bond activity in female patients with skeletal muscle pain syndrome. The subjects were 24 female patients with skeletal muscle pain syndrome were divided into 2 groups: a yoga exercise group ($n = 12$) and a non-exercise control group ($n = 12$). Body composition, maximum oxygen uptake, cortisol level, and creatinine kinase myocardial bond activity were measured before and after a 12-week yoga exercise program. The study shown after the 12-week yoga exercise program, the exercise group exhibited slightly higher maximum oxygen uptake and creatinine kinase myocardial bond activity than the control group, but the differences were not statistically significant. In addition, the exercise group exhibited a significant decrease in cortisol level. They have concluded from the study regular and continuous aerobic exercise such as yoga improves body composition, maximum oxygen uptake, cortisol level, and creatinine kinase myocardial bond activity in female patients with skeletal muscle pain syndrome.

Linda E Carlson et.al., (2004) investigated the relationships between a mindfulness-based stress reduction meditation program for early stage breast and prostate cancer patients and quality of life, mood states, stress symptoms, and levels of cortisol, dehydroepiandrosterone-sulfate (DHEAS) and melatonin. Fifty-nine patients with breast cancer and 10 with prostate cancer enrolled in an eight-week Mindfulness-Based Stress Reduction (MBSR) program that incorporated relaxation, meditation, gentle yoga, and daily home practice. Demographic and health behavior variables, quality of life, mood, stress, and the hormone measures of salivary cortisol, plasma DHEAS and salivary melatonin were assessed pre and post-intervention. Results from this study were significant improvements were seen in overall quality of life, symptoms of stress, and sleep quality, but these improvements were not significantly correlated with the degree of program attendance or minutes of home practice. No significant improvements were seen in mood disturbance. Improvements

in quality of life were associated with decreases in afternoon cortisol levels, but not with morning or evening levels. Changes in stress symptoms or mood were not related to changes in hormone levels. They concluded from the study were MBSR program enrollment was associated with enhanced quality of life and decreased stress symptoms in breast and prostate cancer patients, and resulted in possibly beneficial changes in hypothalamic-pituitary-adrenal (HPA) axis functioning.

Singh RB et.al., (1993) did a study on effects of diet and lifestyle changes on atherosclerotic risk factors after 24 weeks on the Indian Diet Heart Study. In a randomized, single-blind, controlled trial, 621 patients were assigned into intervention diet A (group A, 310 patients) and control diet B (group B, 311 patients) for a period of 24 weeks. After 24 weeks as revealed by dietary questionnaires, group A patients received a diet with a higher percentage of calories from fruits and vegetables and complex carbohydrates, a higher polyunsaturated/saturated fat ratio diet and a larger amount of soluble dietary fiber, antioxidant vitamins and minerals and low saturated fat and cholesterol than group B. Group A patients also did more physical and yogic exercises than group B. Adherence to diet and exercise was obtained through questionnaires and information obtained was quantified into a formula. After 24 weeks, the overall score of diet and exercises was significantly higher in group A than in group B. There was a significant decrease in serum total cholesterol (13.3 percent), low-density lipoprotein cholesterol (16.9 percent), triglycerides (19.2 percent), fasting blood glucose (19.5 percent) and blood pressures (11.5/6.2 mm Hg) in the intervention group compared with initial levels and changes in group B. The effect of exercise on the decrease in risk factors was additive. Within group A, overall score for diet and exercise was greater in one subset of 116 patients in the intervention group which had maximal lifestyle changes.

2.9 STUDIES ON SELECTED VARIABLES IN YOGA AND OTHERS

Mayuri Ramesh Dandge (2012) did a study on a comparative study of impact of yoga practice on adjustment and aggression of urban and rural teenagers. 400 teenagers were selected from urban and rural areas of Aurangabad District. The stratified randomize sample taken into consideration for the study. In which 200 subjects were taken from doing with yoga practice daily since last three years and 200 were taken without yoga practice or any kind of exercise. Both groups were made with equal number of students belong to urban (n = 200) and rural (n = 200). All four

sub groups were made with equal number of male (n = 100) and female (n = 100) students. Subjects who underwent yoga practices were found to be good at their overall adjustment as compared to those who were not involve in yoga practices. Male & female and urban & rural communities differ significantly on their level of total adjustment. Subjects who underwent yoga practices were found to be less aggressive as compared to those who were not involve in yoga practices. Male & female and urban & rural communities not significantly differ on their level of aggression.

Sonia Sharma (2004) did a study on effect of yoga and meditation practices on self-esteem, self-disclosure, emotional intelligence and social adjustment of the criminals at a model jail. 80 adolescent jail inmates at the Burail jail in the months of June and July 2003 were taken as a sample for the study. These eighty adolescents were taken as experimental group and control group randomly. In this phase the initial scores were obtained pertaining to self-esteem, self-disclosure, emotional intelligence and social adjustment. Experimental group was given training in Yoga and Meditation exercises by the investigator herself for two months and the control group was not given any training in yoga and meditation exercises. The final scores were obtained pertaining to self-esteem, self-disclosure, emotional intelligence and social adjustment. Training in Yoga and Meditation practices was found to be effective in enhancing the self-esteem, self-disclosure, emotional intelligence and social adjustment of jail inmates as compared to those who did not have any formal training in yoga and meditation practices.

2.10 SUMMARY OF THE LITERATURE

The investigator has collected all the reviews (98) related to yogic practices and diet on related to physiological, hormonal and psychological variables from the library of Tamil Nadu Physical Education and Sports University, Madras University and on the internet to provide sufficient knowledge to the readers and for the effective analysis of the present study.

The reviews are presented under the nine sections namely studies on physiological variables in yoga and menopause (n=eight), studies on hormonal variables in yoga and menopause (n=ten) Studies on psychological variables in yoga and menopause (n=12), studies on physiological variables in diet and menopause (n=21), studies on hormonal variables in diet and menopause (n=four), studies on

psychological variables in diet and menopause (n=two), studies on other variables in diet and yoga on menopause (n=26), studies on selected variable in yoga and women (n=13) and studies on selected variable in yoga and others (n=two).

Also the reviews show that the effect of yogic practices and diet modification that there were significant changes on physiological, hormonal and psychological variables. The investigator has found much more studies made on different yogic practices and diet. Research studies using yogic practices with and without diet modification revealed compatible results from Abhishek Chaturvedi, et al. (2016), Márcia P. Jorge, et al, (2016), Chandrasekaran MR and Duraisami V. (2016), Sangeetha U.S. (2016), Willemijn AM. Van Gemert, et al. (2015), Grindler NM and Santoro NF (2015), Carpenter JS, et al. (2015), Ram Kishore and Rameswar Pal (2014), Vishal R. Tandon, et al. (2014), Kumar A et al (2013), Khadka.R, et al. (2013), Thirthalli .J, et al. (2013), Mayuri Ramesh Dandge (2012), Shim C. S. et al. (2012), Palasuvan A. et al. (2011), Jennifer Daubenmier et al. (2011), Anjaladevi .M. (2011), Arnulfo Ramos-Jimenez, et al. (2009), Francisca M. Vera et al. (2009) Baird D D, et al. (2009), Min Sung Ha, et al. (2005), Robert A. Carels, et al. (2004), Sonia Sharma (2004), Verzosa Sophia M.L. (1998), Ole lander Svendsen, Christian Hassager and Claus Christiansen (1993) and Irena Shanti (1993). There was clear evidence that the use of yogic practices and diet were the effective methods to improve the selected variables among menopausal women

So the research was interested in the same and found it would be more useful for menopausal women 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 III chapter.