total 24 variables, with thirteen direct and eleven derived anthropometric variables; while physical efficiency parameters were physical fitness index, VO2max, energy expenditure and anaerobic power. The data of the experimental group were compared with those of the control group by "t" test, using SPSS v.15.0 and MS-Excel v.2013. It was found that the analysis of collected data showed majority of the students have normal range of BMI (67.95%), but, 21.95% of students found to be overweight and 3.84% are obese. They also showed higher fat mass [14.40 (4.11)], but, lower waist to hip ratio and tonicity index. They were found to have poor to moderate physical fitness [57.60 (3.90)] and higher energy expenditure [5.61 (0.72)]. It was concluded that the present obesity screening reports almost one of four female students (24 out of 100 participants) are overweight/obese, indicated higher body fat distribution and increased propensity of being obese with age. Thus, the overall data along with their low physical fitness points out to health risks among female undergraduates of Kolkata.

Katherine E et.al., (2003) conducted a study on the effect of weight loss and life style changes on vascular inflammatory markers in obese women. One hundred twenty premenopausal obese women (body mass index > or =30) aged 20 to 46 years without diabetes, hypertension, or hyperlipidaemia. Randomized single-blind trial conducted from February 1999 to February 2002 at a university hospital in Italy. The 60 women randomly assigned to the intervention group received detailed advice about how to achieve a reduction of weight of 10% or more through a low-energy Mediterranean-style diet and increased physical activity. The control group (n = 60) was given general information about healthy food choices and exercise. It was Lipid and glucose intake, blood pressure, homeostatic model assessment of insulin sensitivity, and circulating levels of interleukin 6 (IL-6), interleukin 18 (IL-18), C-reactive protein (CRP) and adiponectin. It was found that the After 2 years, women in the intervention group consumed more foods rich in complex carbohydrates (9% corrected difference; P<.001), monounsaturated fat (2%; P =.009), and fibre (7 g/d; P<.001); had a lower ratio of omega-6 to omega-3 fatty acids (-5; P<.001); and had lower energy (-310 kcal/d; P<.001), saturated fat (-3.5%; P =.007), and cholesterol intake (-92 mg/d; P<.001) than controls. Body mass index decreased more in the intervention group than in controls (-4.2; P<.001), as did serum concentrations of IL-6

(-1.1 pg/mL; P =.009), IL-18 (-57 pg/mL; P =.02), and CRP (-1.6 mg/L; P =.008), while adiponectin levels increased significantly (2.2 microg/mL; P =.01). In multivariate analyses, changes in free fatty acids (P =.008), IL-6 (P =.02), and adiponectin (P =.007) levels were independently associated with changes in insulin sensitivity. It was concluded that the multidisciplinary program aimed to reduce body weight in obese women through lifestyle changes was associated with a reduction in markers of vascular inflammation and insulin resistance.

Bell et.al., (2007) conducted a study on the Exercise Alone Reduces Insulin Resistance in Obese Children Independently of Changes in Body Composition. The objective of this study was to assess the effect of a structured 8-week exercise training program on insulin resistance and changes in body composition in obese children. The study was 8 weeks of structured supervised exercise intervention with outcome measures before and after the exercise period. Fourteen obese children (12.70} 2.32 year; eight male, six female) with high fasting insulin levels were enrolled into the study. Intervention consisted of 8 weeks of supervised circuit-based exercise training, composed of three fully supervised 1-h sessions per week. Outcome measures were assessed pertaining program and post training program and included insulin sensitivity (glycemic hyper insulinemic clamp studies), fasting insulin and glucose levels, body composition using dual energy x-ray absorptiometry scan, lipid profile, and liver function tests. It was found that the significantly improved sensitivity after 8 weeks of training ((Mlbm 8.20 3.44 to 10.03) 4.33 mg/kg. Min, P < 0.05). Sub maximal exercise heart rate responses were significantly lower following the training (P < 0.05), indicating an improvement in cardio respiratory fitness. Dual energy x-ray absorptiometry scans revealed no differences in lean body mass or abdominal fat mass. It was concluded that the Eight weeks exercise training program increases insulin sensitivity in obese children, and this improvement occurred in the presence of increased cardio respiratory fitness but is independent of measurable changes in body composition.

Magkos et.al., (2006) conducted a study on the Diet, Blood Lipid Profile and Physical Activity Patterns in Primary School Children from a Semi-Rural Area of Greece. The aim of this study was to assess the cardiovascular risk profile of young

adolescents living in a semi-rural area of mainland Greece, Volos. A total of 198 children (106 females and 92 males) aged 11.6} 0.4 years were randomly recruited. Mean body mass index was 20.4} 3.5 kg m−2, while 30.3% of children were overweight and 6.7% were obese; no differences were observed between boys and girls. Mean plasma cholesterol (4.93, 0.75 mmol L−1), low-density lipoprotein-cholesterol (3.29, 0.64 mmol L−1) and triglyceride (0.97, 0.31 mmol L−1) concentrations were above age-specific recommended values. On the other hand, mean high-density lipoprotein-cholesterol was accepted for 92.3% of the children. Self-reported daily energy intake (8.37, 3.06 MJ) was adequate for an age, but intake of fat was high (42.0, 9.2% of energy) and that of carbohydrates was relatively low (44.5, 10.0% of energy). Saturated fat consumption was elevated (15.6} 4.3% of energy), while polyunsaturated fat intake fell short (4.8, 1.6% of energy). It was study participants spent 9.60, 6.44 h week−1 on moderate to vigorous physical activities, while they devoted 16.60, 8.81 h week−1 to sedentary activities. Boys spent significantly more time than girls on both physical (P < 0.001) and sedentary (P = 0.001) activities. No major gender differences were observed in anthropometric, dietary and plasma lipid parameters. It was concluded that the worrisome trends that have been documented in Greek youngsters elsewhere, and predict an unfavorable cardiovascular risk profile of the Greek population in the foreseeable future.

Ramesh and Subramaniam (2010) conducted a study on the effect of Physical Activity and Aerobic Fitness on Health Related Physical Fitness Variables of Overweight and Obese Adolescence. The selected variable includes muscular endurance flexibility, cardio-respiratory endurance, and body composition (body mass index). 30 obese boys age groups between 12 to 15 years and they were selected at random from Tirunelveli district higher secondary schools. They were divided into two equal groups and assigned as experimental group and control group. The experimental groups were given physical activity and aerobic exercise for a period of twelve weeks, both morning and evening on five days a week. Control group did not participate in physical activity and aerobic exercise training programme. The collected data was statistically analyzed by using analysis of covariance (ANCOVA). The Experiment group had a significant Improvement on the health related physical fitness variables of overweight and obese children than the control group. It was

concluded that the experimental group has achieved significant improvement on muscular endurance, flexibility, cardio-respiratory endurance, and body mass index in significantly on due to the physical activity and aerobic exercise training programme.

Fujita S et.al., (2007) conducted a study on Aerobic exercise overcomes the age-related insulin resistance of muscle protein metabolism by improving endothelial function and Akt/mammalian target of rapamycin signaling. It was hypothesized that aerobic exercise restores muscle protein anabolism in response to insulin by improving vasodilation in older subjects. We measured blood flow, endothelin-1, Akt/mammalian target of rapamycin (mTOR) signalling, and muscle protein kinetics in response to physiological local hyper insulinemia in two groups of older subjects following a bout of aerobic exercise (EX group: aged 70 ± 2 years; 45-min treadmill walk, 70% heart rate max) or rest (CTRL group: aged 68 ± 1 years). Baseline endothelin-1 was lower and blood flow tended to be higher in the EX group, but protein kinetics was not different between groups. Insulin decreased endothelin-1 ($P <$ 0.05) in both groups, but endothelin-1 remained higher in the CTRL group ($P < 0.05$) and blood flow increased only in the EX group (EX group: 3.8 ± 0.7 to 5.3 ± 0.8; CTRL group: 2.5 ± 0.2 to 2.6 ± 0.2 ml $\cdot$ min^{-1} $\cdot$ 100 ml leg^{-1}). Insulin improved Akt phosphorylation in the EX group and increased mTOR/S6 kinase 1 phosphorylation and muscle protein synthesis (EX group: 49 ± 11 to 89 ± 23; CTRL group: 58 ± 8 to 57 ± 12 nmol $\cdot$ min^{-1} $\cdot$ 100 ml leg^{-1}) in the EX group only ($P < 0.05$). Because breakdown did not change, net muscle protein balance became positive only in the EX group ($P < 0.05$). It was concluded that aerobic exercise restores the anabolic response of muscle proteins to insulin by improving endothelial function and Akt/mTOR signalling in older subjects.

Hutchison SK et.al., (2012) conducted a study on the effect of exercise training on insulin sensitivity, mitochondria and computed tomography muscle attenuation in overweight women with and without polycystic ovary syndrome. Sixteen PCOS and 13 non-PCOS overweight women were assessed, and eight PCOS and seven non-PCOS women were reassessed after 12 weeks of moderate and vigorous exercise training. Outcomes included insulin sensitivity (glucose infusion rate [GIR]), skeletal muscle gene expression and protein abundance, enzyme activity

of selected mitochondrial components, and computed tomography (CT) attenuation-estimated muscle lipid. It was found that GIR was lower in women with PCOS versus those without (p = 0.01) and increased with exercise in both groups. Baseline CT muscle attenuation suggested a trend to less muscle lipid in PCOS, which increased with exercise training, with a difference in the change in muscle lipid (p = 0.01, age-corrected), compared with non-PCOS women. GIR correlated with PGC1A gene expression across the whole group; skeletal muscle expression of mitochondrial biogenesis markers was not different between groups at baseline, or after training. Neither lipid changes nor mitochondrial changes correlated with changes in GIR. It was concluded that the differences in IR in women with and without PCOS were not explained by differences in skeletal muscle lipid or mitochondrial parameters. Improvements in IR with exercise were dissociated from mitochondrial parameters. CT muscle attenuation suggested a differential capacity of PCOS muscle to store lipid compared with non-PCOS.

Imperatore G et.al., (2006) conducted a study on physical activity, cardiovascular fitness, and insulin sensitivity among U.S. adolescents: the National Health and Nutrition Examination Survey, 1999–2002. The study included 1,783 U.S. adolescents (11% Mexican American, 14% non-Hispanic black, 63% non-Hispanic white, and 12% other) aged 12-19 years who were examined in the 1999-2002 National Health and Nutrition Examination Survey. Physical activity was assessed by questionnaire and expressed in units of MET hours per week. Predicted maximal oxygen uptake VO(2max), expressed in millilitres per kilogram of body weight per minute, a measure of CVF, and was determined by a sub maximal multistage treadmill test. Insulin sensitivity was defined by the Quantitative Insulin Sensitivity Check Index. It was found that boys were more likely than girls to be highly active (>or=30 MET h/week; 51 vs. 37%, P < 0.001) and had higher levels of CVF (mean VO (2max) 47 vs. 39 ml x kg (-1) x min (-1), P < 0.001). Sex-specific multiple regression models controlled for age, race/ethnicity, and BMI showed that in boys, high levels of physical activity and high levels of CVF were significantly and positively associated with insulin sensitivity (beta = 0.84, P < 0.001 and beta = 0.82, P = 0.01, respectively). Among girls, insulin sensitivity was not significantly associated with physical activity or with CVF but was inversely and significantly associated with

BMI. It was concluded that the increased physical activity and CVF may have an independent effect of improved insulin sensitivity among boys. For girls, the primary role of physical activity may be in weight maintenance.

Johnson NA et.al., (2009) conducted a study on aerobic exercise training reduces hepatic and visceral lipids in obese individuals without weight loss. However, the effect of aerobic exercise on liver fat independent of weight loss has not been clarified. We assessed the effect of aerobic exercise training on hepatic, blood, abdominal and muscle lipids in 19 sedentary obese men and women using magnetic resonance imaging and proton magnetic resonance spectroscopy (H-MRS). Four weeks of aerobic cycling exercise, in accordance with current physical activity guidelines, significantly reduced visceral adipose tissue volume by 12% (P < 0.01) and hepatic triglyceride concentration by 21% (P < 0.05). This was associated with a significant (14%) reduction in plasma free fatty acids (P < 0.05). Exercise training did not alter body weight; lateral is intra my cellular triglyceride concentration, abdominal subcutaneous adipose tissue volume, H-MRS-measured hepatic lipid saturation, or HOMA-IR (homeostasis model assessment of insulin resistance; P > 0.05). It was concluded that the data provide the first direct experimental evidence demonstrating that regular aerobic exercise reduces hepatic lipids in obesity even in the absence of body weight reduction. Physical activity should be strongly promoted for the management of fatty liver, the benefits of which are not exclusively contingent upon weight loss.

Habibzadeh et.al., (2010) conducted a study on the effects of Exercise in Obese Women with Bulimia Nervosa. The purpose of the present study was to examine the effect of walking exercise in order to provide a method for overcoming bulimia nervosa in obese young women suffering from bulimia nervosa. Twenty obese women with bulimia nervosa (body mass index [BMI]>30) and a mean age of 22.00 ± 1.50 years volunteered to participate in this study. They were randomly assigned to exercise (n=10) and control (n=10) groups. Both groups underwent anthropometric measurements and blood analysis before and after the training program. Exercise program included 30-minute walking sessions at 50-75% of maximal heart rate, 3 days per week and for 2 months. After 2 months significant

changes were observed in all anthropometric variables (P<0.001). Percent body fat, fat mass, BMI, body weight and lean mass changes in response to training were significant in the exercise group (P<0.001). It was concluded that moderate aerobic exercises such as moderate walking are suitable behavior therapies for overcoming bulimia nervosa in obese young women.

Van Der Heijden GJ et.al., (2010) conducted a study on 12-week aerobic exercise program reduces hepatic fat accumulation and insulin resistance in obese, Hispanic adolescents. It was hypothesized that 12-week controlled aerobic exercise program without weight loss reduces visceral, hepatic, and intra-myocellular fat content and decreases insulin resistance in sedentary Hispanic adolescents. Twenty-nine post pubertal (Tanner stage IV and V), Hispanic adolescents, 15 obese (7 boys, 8 girls; 15.6 +/- 0.4 years; 33.7 +/- 1.1 kg/m(2); 38.3 +/- 1.5% body fat) and 14 lean (10 boys, 4 girls; 15.1 +/- 0.3 years; 20.6 +/- 0.8 kg/m(2); 18.9 +/- 1.5% body fat), completed a 12-week aerobic exercise program (4 x 30 min/week at > or =70% of peak oxygen consumption (VO(2)peak)). Measurements of cardiovascular fitness, visceral, hepatic, and intra-myocellular fat content (magnetic resonance imaging (MRI)/magnetic resonance spectroscopy (MRS)), and insulin resistance were obtained at baseline and post exercise. In both groups, fitness increased (obese: 13 +/- 2%, lean: 16 +/- 4%; both P < 0.01). In obese participants, intra-myocellular fat remained unchanged, whereas hepatic fat content decreased from 8.9 +/- 3.2 to 5.6 +/- 1.8%; P < 0.05 and visceral fat content from 54.7 +/- 6.0 to 49.6 +/- 5.5 cm(2); P < 0.05. Insulin resistance decreased indicated by decreased fasting insulin (21.8 +/- 2.7 to 18.2 +/- 2.4 microU/ml; P < 0.01) and homeostasis model assessment of insulin resistance (HOMA(IR)) (4.9 +/- 0.7 to 4.1 +/- 0.6; P < 0.01). The decrease in visceral fat correlated with the decrease in fasting insulin (R (2) = 0.40; P < 0.05). It was found that significantly no changes were observed in any parameter in lean participants except a small increase in lean body mass (LBM). It was concluded that the controlled aerobic exercise program, without weight loss, reduced hepatic and visceral fat accumulation, and decreased insulin resistance in obese adolescents.

Subaash B and Elangovan R (2014) conducted a study on the effect of simplified kundalini yoga and walking on selected physiological variables among obese school boys. It was hypothesized that there would be significant differences in physiological variables such as body mass index (BMI of 30 to 35) school boys from aged between 14 to 18 years were selected randomly. The subjects were divided into two experimental groups and a control group of 15 subjects each in a group. Experimental groups underwent simplified kundalini yoga and walking respectively for the period of 12 weeks, six days per week of one hour basically, then slightly increased to 1.5 hours and 1.30 hours. The control group was not exposed to any specific training. The pre-test and post-test was conducted before and after and after the training for all the groups. The body mass index (BMI) was measured by weighing machine and meter scale and resting pulse rate was measured by BP monitor machine. The data collected from the subjects were treated statistically through using Analysis of covariance (ANCOVA) to determine the significant difference. The Hypotheses were tested at 0.05 level of confidence. The results and the conclusions of the study showed that simplified Kundalini yoga and walking were effective in decreasing significantly as result of body mass index (BMI) and resting pulse rate among obese school boys than the control group and simplified Kundalini yoga was effective than walking in decreasing body mass index (BMI) and resting pulse rate among school boys.

Sabia et.al., (2004) compared the effect of continuous aerobic and intermittent anaerobic physical exercise associated with nutritional orientation on weight reduction, body composition, biochemical measures and physical capacity of obese adolescents. 28 adolescents between 12 and 14 years old were studied, whose body mass index (BMI) is above percentile 95 for age and gender. The volunteers were randomly distributed into 2 groups: continuous walking exercise (GEC; n = 13) and running intermittent exercise (GEI; n = 15) and underwent a physical training program 3 times a week during 16 weeks, with duration from 20 to 40 minutes. Nutritional orientation occurred once a week, in 60-minute group sessions, throughout the entire experiment. In the initial and final periods, weight and height were measured so as to calculate the BMI, as well as subcutaneous fold, arm (AC) and arm muscle circumferences (AMC), body composition by means of electric bio

impedance, biochemical serum analyses (glycaemia and lipids), and direct determination of maximum oxygen intake (VO2max) and anaerobic threshold (LAn). In both groups (GEC and GEI), anthropometric findings, BMI and subcutaneous folds, were significant decreased. In biochemical evaluation, a significant decrease occurred in GEC with respect to HDL, LDL and total cholesterol serum levels, although still within normal values. Values of HDL and triglycerides presented significant decrease in GEI. VO2max values increased significantly in both groups. It was concluded that the physical activity proposed for both GEC and GEI was sufficient and satisfactory, promoting weight loss, better body composition and lipid levels, as well as an increase in the adolescents' aerobic capacity.

Weil BR et.al., (2011) conducted a study on the enhanced endothelin-1 system activity with overweight and obesity. Endothelin (ET)-1-mediated vasoconstrictor tone contributes to the development and progression of several adiposity-related conditions, including hypertension and atherosclerotic vascular disease. The aims of the present study were to determine 1) whether endogenous ET-1 vasoconstrictor activity is elevated in overweight and obese adults, and, if so, 2) whether increased ET-1-mediated vasoconstriction contributes to the adiposity-related impairment in endothelium-dependent vasodilatation. Seventy-nine adults were studied: 34 normal weight [body mass index (BMI) < 25 kg/m (2)], 22 overweight (BMI ≥ 25 and < 30 kg/m (2)), and 23 obese (BMI ≥ 30 kg/m (2)). Forearm blood flow (FBF) responses to intra-arterial infusion of ET-1 (5 pmol/min for 20 min) and selective ET-1 receptor blockade (BQ-123, 100 nmol/min for 60 min) were determined. In a subset of the study population, FBF responses to ACh (4.0, 8.0, and 16.0 μg·100 ml tissue (-1) ·min (-1)) were measured in the absence and presence of selective ET-1 receptor blockade. The vasoconstrictor response to ET-1 was significantly blunted in overweight and obese adults (∼ 70%) compared with normal weight adults. Selective ET-1 receptor blockade elicited a significant vasodilator response (∼ 20%) in overweight and obese adults but did not alter FBF in normal weight adults. Confusion of BQ-123 did not affect FBF responses to ACh in normal weight adults but resulted in and∼ 20% increase (P < 0.05) in ACh-induced vasodilatation in overweight and obese adults. It was concluded that the overweight and obesity are associated with enhanced ET-1-mediated vasoconstriction that

contributes to endothelial vasodilator dysfunction and may play a role in the increased prevalence of hypertension with increased adiposity.

Leite (2009) examined the effects of physical exercise and nutritional guidance on body composition, physical fitness, and lipid profile and insulin resistance among obese adolescents with and without metabolic syndrome. Sixty-four obese adolescents (26 boys), 10-16 years of age, were divided into two groups: with metabolic syndrome (n=29) and without metabolic syndrome (n=35). They were classified as having metabolic syndrome if they met three or more criteria for age and sex according to the Adult Treatment Panel III (ATP III). Blood pressure, waist circumference, maximum oxygen uptake (VO2peak), blood glucose, blood insulin, homeostatic model assessment (HOMA-IR), quantitative insulin sensitivity check index (QUICKI) and lipid profile were assessed at baseline and after 12 weeks of intervention. Both groups participated in 12 weeks of physical education and two nutritional guidance sessions. Each physical education session consisted of 50 min indoor cycling, 50 min of walking/running and 20 min of stretching, three times a week. Results: Fifty-five participants (with metabolic syndrome=25; without metabolic syndrome=30) completed the treatment. After 12 weeks, both groups showed reductions in body weight, BMI z-score, waist circumference, fat mass and triglycerides; and increases in height, HDL-C and VO2peak ($p<0.05$). In addition, the group with metabolic syndrome presented reduced systolic blood pressure and increased insulin sensitivity ($p<0.05$). The risk factors for metabolic syndrome decreased by 72% following the multidisciplinary intervention, the risk factors decreased, with improvements in physical fitness and metabolic profile. The multidisciplinary intervention was effective in reducing metabolic syndrome.

Hanton et.al., (2004) investigated the symptom responses associated with competitive anxiety through a fine-grained measurement approach. Incorporating dimensions of intensity, perceptions of direction, and frequency of intrusions, possible time-to-event changes were assessed with respect to the between-subjects variable of skill level. Male athletes (N=82), separated into two skill classifications (club N=45 vs. national N=37), completed the competitive state anxiety inventory-2 (CSAI-2) modified to account for the dimensions of intensity, direction and frequency at five

pre competition times (1 week, two days, one day, 2 h, 30 min).Multivariate analysis of variance (skill level × time-to-competition) with follow-up analyses indicated main effects for skill level and time-to-competition with no interactions. For skill level differences, national athletes were more facilitative in their interpretation of the symptoms associated with cognitive and somatic anxiety. For change-over-time effects, intensities of cognitive and somatic anxiety increased and self-confidence decreased between 2 h and 30 min precomputation. Frequencies of cognitive anxiety increased from seven to two days, one day to 2 h and 2 h to 30 min precomputation; frequencies of somatic anxiety increased from seven days to two days and 2 h to 30 min pre-event; frequencies of self-confidence increased from seven to two days. Findings support the notion of measuring the separate dimensions of symptoms associated with competitive anxiety and emphasis the importance of assessing these constructs as processes that unfold over-time.

Kercher A and Rapee RM (2009) evaluated a pathway for depressive risk that integrates cognitive diathesis-stress and stress-generation theories, following Hankin and Abramson's (2001, Journal of Clinical Child and Adolescent Psychology, 31(4), 491-504) elaborated cognitive-diathesis transactional stress model. In this model, young adolescents with initial depressive symptoms were hypothesized to experience later stressors that were at least partly dependent on their behavior. The interaction of cognitive vulnerability, a tendency to make depress genic attributions and to ruminate, with these dependent stressors was then hypothesized to predict depressive symptoms after 6 months. This model was supported in a sample of 756 young adolescents, with cognitive style and dependent stressors partly mediating the relationship between initial and subsequent depressive symptoms. Cognitive vulnerability was also linked with an increased likelihood of dependent stressors.

Mullen R et.al., (2009) examined the intensity and direction of the competitive state anxiety response in collegiate athletes as a function of four different coping styles: high-anxious, defensive high-anxious, low-anxious and repressors. Specifically, the study predicted that repressors would interpret competitive state anxiety symptoms as more facilitative compared to high-anxious, defensive high-anxious, and low-anxious performers. Separate Multivariate Analyses of Variance

(MANOVA) was performed on the intensity and direction subscales of the modified Competitive State Anxiety Inventory-2 (CSAI-2). A significant main effect was identified for trait worry revealing that low trait anxious athletes reported lower intensities of cognitive and somatic anxiety and higher self-confidence and interpreted these as more facilitative than high trait anxious athletes. The prediction that performers with a repressive coping style would interpret state anxiety symptoms as more facilitative than performers with non-repressive coping styles was not supported.

Jennifer M et.al., (2009) examined the compared psychological correlates and outcomes of yoga with more traditional forms of exercise. The authors' primary aim was to compare changes in the psychosocial outcomes of mood and state anxiety produced by an acute bout of yoga or walking among older adults. The secondary aim was to compare selected psychosocial correlates of activity. Participants were 51 adults who were 50 years of age or older who walked for exercise or participated in a yoga class. Results revealed that yoga participants had significantly greater levels of depression and perceived barriers to exercise, and lower quality of life than did walkers. With control for these differences, yoga practitioners had improved levels of fatigue pre- to post session, compared with walkers. With control for differences in demographic variables, these changes were no longer significant. It is possible that yoga practitioners seek out mindful-based exercise to cope with greater levels of depression and lower levels of quality of life.

Abd E Kader SM et.al., (2013) conducted a study on impact of moderate versus mild aerobic exercise training on inflammatory cytokines in obese type 2 diabetic patients. Fifty obese type 2 diabetic patients of both sexes with body mass index (BMI) varying from 31 to 36 kg/m2 , non-smokers, free from respiratory, kidney, liver, metabolic and neurological disorders, participated in this study. Their age ranged from 40 to 55 years. The subjects were included into two equal groups; the first group (A) received moderate aerobic exercise training. The second group (B) received mild aerobic exercise training, three times / week for 3 months. It was found that the mean values of leptin, TNF- alpha, IL2, IL4, IL6, HOMA-IR and HBA1c were significantly decreased in group (A) and group (B). Also, there were significant

differences between both groups after treatment. It was concluded that Moderate aerobic exercise training modulates inflammatory cytokines more than mild aerobic exercise training in obese type 2 diabetic patients.

Kim H J (2013) conducted study on relationship between the level of physical activity and body satisfaction in collegiate females. Subjects were recruited from at one university of South Korea (N=198) and at one university in the Midwest United States the (N=192). Data was collected by using a self-reported questionnaire including demographic information, the Body Dissatisfaction Scale-Eating Disorders Inventory (BDS-EDI), International Physical Activity Questionnaire (IAPQ), and The Objectified Body Consciousness Scale (OBS). Descriptive statistics, correlation analysis, and multiple regression analysis were conducted for the overall variables. It The results of the study indicated the participants' physical activity levels were not related to body dissatisfaction among Korean and American female college students. However, Korean students were more dissatisfied with their body image than American students based on variables' total score (Body dissatisfaction scores; Korean 31.86 > American 28.21, Body shame scores; Korean 26.54 > American 22.40). Compared to the physical activity level in Korean students, American students indicated higher physical activity levels (Total recreation METs; Korean 99.6 < American 1987.07). The participation preferences of exercise types were not related to students' weight status (BMI). Pearson chi-square analyzing P value was .271 among American students and .471 among Korean students. However, BMI was related to body dissatisfaction in both American and Koran students (P < .001). It was concluded that Korean and American female students' physical activity levels were not associated with body satisfaction. However, this study found cultural differences between Korea and America in other areas.

2.4 STUDIES RELATED TO OBESITY WITH DEPENDENT VARIABLES

Cramer H et.al., (2016) conducted a study on the Yoga for abdominal obese women – a randomized controlled trial. 60 obese women independent variables were Yoga. 60 women with abdominal obesity (waist circumference ≥ 88 cm; body-mass index [BMI] ≥ 25) were randomly allocated in a 2:1 ratio to either a 12-week yoga

intervention (n = 40) or a waiting list (n = 20). The waist circumference was the primary endpoint. Secondary (exploratory) endpoints included the waist/hip ratio, body weight, BMI, body fat percentage, body muscle mass percentage, blood pressure, health-related quality of life, self-esteem, subjective stress, body awareness, and body responsiveness, and the safety of the intervention. The persons assessing the outcomes were blinded to the group to which the patients belonged. The patients in the yoga group participated in a mean of 30.2±9.2 (maximum, 42) hours of supervised yoga practice. Their abdominal circumference was significantly reduced in comparison to the participants on the waiting list, with an intergroup difference of −3.8 cm (95% confidence interval [−6.1; −1.5]; p = 0.001). There were further, moderate intergroup differences in the waist/hip ratio, body weight, BMI, body fat percentage, body muscle mass percentage, mental and physical well-being, self-esteem, subjective stress, body awareness, and trust in bodily sensations (all p<0.05). There were no serious adverse events. None of the participants embarked on a low-calorie diet while participating in the study. The 12-week yoga intervention had moderately strong positive effects on anthropometric and self-reported variables in women with abdominal obesity. It was concluded that Yoga is safe in this population and can be recommended as a technique for combating abdominal obesity in women.

Wagh R et.al., (2017) conducted a study on the Comparative effect of treadmill exercise and yoga on Superoxide dismutase level in normal young adults. Fifty male subjects of age group 18-20years and were divided into two groups, treadmill exercise (Group A) and yoga (Group B) consisting of 25 each in Department of Physiology at Exercise Physiology Lab (JNMC, DMIMS, Sawangi Meghe, Wardha). On regular performance of exercise, subjects were assessed at the start of and after 3 months of the training schedule (45min/ 5days/ week). Blood samples were collected to assess the SOD levels. Results were compared using student paired "t" test and unpaired "t" test & age-wise distribution by Chi-Square test. Results showed that the pre-exercise levels of SOD in Group A (11.56±1.0) and Group B (11.56±1.0) and the post-exercise levels in Group A (12.01±1.09) and Group B (13.31±0.9). Thus the above study shows that yoga has more beneficial effect than the treadmill exercise which leads to decrease in the free radical production.

Chauhan A et.al., (2017) conducted a study on the Yoga Practice Improves the Body Mass Index and Blood Pressure: A Randomized Controlled Trial. The present study was conducted to determine the effect of yoga practice on 64 participants (age 53.6 ± 13.1 years) (experimental group) whereas the results were compared with 26 healthy volunteers (control group). We examined the effects of yoga on physiological parameters in a 1-month pilot study. Most of the participants were learner and practiced yoga for 1 h daily in the morning for 1 month. BMI and BP (systolic and diastolic) were studied before and after 1 month of yoga practice. Yoga practice causes decreased BMI (26.4 ± 2.5–25.22 ± 2.4), systolic BP (136.9 ± 22.18 mmHg to 133 ± 21.38 mmHg), and diastolic BP (84.7 ± 6.5 mmHg to 82.34 ± 7.6 mmHg). On the other hand, no significant changes were observed in BMI and BP of control group. It was concluded that the yoga practice has potential to control BMI and BP without taking any medication.

Tripathi P and Dubey A (2015) conducted a study on the Obesity related psychological problems and involvement of mothers in obese behavior of adolescent daughters. The present study is planned to track the physical, psychological, social and environmental factors associated with the overweight and obesity of children and adolescents of eastern part of Uttar Pradesh and also try to focus on the parents of such children on how they contribute in their children weight gain and their awareness about the health related consequences of obesity. The preliminary interview data on 25 obese girls (aged between 13 to 18 years) suggested that all the participants were not part in extracurricular activities of school, not using exercises, yoga in their daily routine and also they were admitted that most of the day they are not taking proper breakfast. Aggression, stress and low confidence was also noticed in all the participant girls. Parents were aware of obesity and some of its unable efforts motivate their girls for proper diet and exercise. These obese girls face and teasing by their peers and siblings and this is one reason that they did not participant in social occasion's outdoor activities and parties and their problem of obesity further aggravates. The findings are throwing a light on the causes and maintaining factors of obesity as well as the psychological and social indicators of obesity and some associated factors, the parental role etc.

Yadav S and Tadang M (2013) conducted a study on the effects of 6-week yoga asana on basal metabolic rate of novice female players. Thirty female novice players were selected as subjects for the present investigation aged were ranging from 17- 24 years. To investigate the influence, 6-week yoga asana was imparted to the subject of group A (Yoga training) and B (control group). The significance of difference was tested for the basal metabolic rate by paired t test. The 6-week of yoga asana includes Poorna Bhujangasana, Baddhapadmasana, Kukkut asana, Halasana and Ardha Matsyendrasana. The effect of 6-week yoga asana was used to identify the significant differences (p<0.005-0.001) improvement on basal metabolic rate of novice female players in group A (Yoga training) compared with control group B. Asana training may be recommended to improve other physiological based performance and enhance basal metabolic rate.

Javnbakht M et.al., (2009) conducted a study on the effects of yoga on depression and anxiety of women. The experimental group ($n = 34$) participated in twice weekly yoga classes of 90 min duration for two months. The control group ($n = 31$) was assigned to a waiting list and did not receive yoga. Both groups were evaluated again after the two-month study period. The independent variables were yoga practices. The study involved a convenience sample of women who were referred to a yoga clinic from July 2006 to July 2007. All new cases were evaluated on admission using a personal information questionnaire well as Beck and Spiel Berger tests. Participants were randomly assigned into an experimental and a control group. It was found that the average prevalence of depression in the experimental group pre and post Yoga intervention was 12.82 ± 7.9 and 10.79 ± 6.04 respectively, a statistically insignificant decrease ($p = 0.13$). The experimental group was compared to the control group, women who participated in yoga classes showed a significant decrease in state anxiety ($p = 0.03$) and trait anxiety ($p < 0.001$). It was suggests that yoga can be considered as a complementary therapy or an alternative method for medical therapy in the treatment of anxiety disorders. It was concluded that there was participation in a two-month yoga class can lead to significant reduction in perceived levels of anxiety in women who suffer from anxiety disorders.

Caceres M et.al., (2008) conducted a study on the prevalence of insulin resistance and its association with metabolic syndrome criteria among Bolivian children and adolescents with obesity. 61 obese children and adolescents aged between 5 and 18 years old. All children underwent an oral glucose tolerance test and fasting blood sample was also obtained to measure insulin, HDL, LDL and triglycerides serum level. The diagnosis of metabolic syndrome was defined according to National Cholesterol Education Program-Adult Treatment Panel (NCEP-ATP III) criteria adapted for children. It was found that 36% of the children in metabolic syndrome, with a higher rate among males (40%) than females (32.2%) (p = 0.599). The prevalence of each of the components was 8.2% in impaired glucose tolerance, 42.6% for high triglyceride level, 55.7% for low levels of high-density lipoprotein cholesterol, and 24.5% for high blood pressure. Insulin resistance (HOMA-IR > 3.5) was found in 39.4% of the children, with a higher rate in males (50%) than females (29%). It was found that strong correlation between insulin resistance and high blood pressure (p = 0.0148) and high triglycerides (p = 0.002). It was statistical significance difference between the presence of a can those cans and insulin resistance. T test was calculated to determine statistical significance at 0.05 level of confidence. The metabolic syndrome has a prevalence of 36% in children and adolescent population in the study. It was concluded that insulin resistance was very common among children with obesity with a significant association with high blood pressure and high triglycerides presence.

Doshi D R and Jogsan Y A (2012) conducted a study on the study on impact of yoga on self-control in obese women. A sample of 13 (n = 13) women with average age 39 years was selected for this study from Yoga Shibir held at 'LIFE', Rajkot, organized by Saurashtra Medical & Educational Charitable Trust. They performed pre-test and post-test scale to measure change, before and after Yoga practice. This scale is made by Arun Kumar Singh and Alpana Sen Gupta in English version and we have used its Gujarati version made by Dr. Yogesh A. Jogsan, Department of Psychology, Sautashtra University, Rajkot. Post observation was made on the last day intervention of Yogic Practices included Omkar, Asanas, Pranayama, Kriyas, Dhyana etc. It was found that indicate the beneficial effect of Yoga for weight-reduction of obese women to improve their self-control. The computed t-value was 0.20. It showed

a non-significant improvement at the parameter, but at the mean it showed better impact of Yoga on self-control. Weight-reduction through Yoga was a part of the study. It was shows a satisfactory decrease of 1.3 kgs. (Mean) in weight. It was concluded that there was significant improved weight-reduction and self-control in obese women due to yoga practices.

Stevens G A et.al., (2012) conducted a study on National, regional, and global trends in adult overweight and obesity prevalence. We estimated trends between 1980 and 2008 in overweight and obesity prevalence and their uncertainty for adults 20 years of age and older in 199 countries and territories. Data were from a previous study, which used a Bayesian hierarchical model to estimate mean body mass index (BMI) based on published and unpublished health examination surveys and epidemiologic studies. Here, we used the estimated mean BMIs in a regression model to predict overweight and obesity prevalence by age, country, year, and sex. The uncertainty of the estimates included both those of the Bayesian hierarchical model and the uncertainty due to cross-walking from mean BMI to overweight and obesity prevalence. It was found that the global age-standardized prevalence of obesity nearly doubled from 6.4% (95% uncertainty interval 5.7-7.2%) in 1980 to 12.0% (11.5-12.5%) in 2008. Half of this rise occurred in the 20 years between 1980 and 2000, and half occurred in the 8 years between 2000 and 2008. The age-standardized prevalence of overweight increased from 24.6% (22.7-26.7%) to 34.4% (33.2-35.5%) during the same 28-year period. In 2008, female obesity prevalence ranged from 1.4% (0.7-2.2%) in Bangladesh and 1.5% (0.9-2.4%) in Madagascar to 70.4% (61.9-78.9%) in Tonga and 74.8% (66.7-82.1%) in Nauru. Male obesity was below 1% in Bangladesh, Democratic Republic of the Congo, and Ethiopia, and was highest in Cook Islands (60.1%, 52.6-67.6%) and Nauru (67.9%, 60.5-75.0%). It concluded that the globally, the prevalence of overweight and obesity has increased since 1980, and the increase has accelerated. Although obesity increased in most countries, levels and trends varied substantially. These data on trends in overweight and obesity may be used to set targets for obesity prevalence as requested at the United Nations high-level meeting on Prevention and Control of NCDs.

Flodmark et.al., (2006) conducted a study on the Interventions to prevent obesity in children and adolescents. Children could be recruited from normal or high-risk populations. Combining the new data with the previous review resulted in an evaluation of 24 studies involving children. Of these, eight reported that prevention had a statistically significant positive effect on obesity, 16 reported neutral results and none reported a negative result (sign test; P=0.0078). Adding the studies included in five other systematic reviews yielded, in total, 15 studies with positive, and 24 with neutral and none with negative results. Thus, 41% of the studies, including 40% of the children studied, showed a positive effect from prevention. These results are unlikely to be a random chance phenomenon (P=0.000061). It was concluded that Based on this evidence, they pointed out that it is possible to prevent obesity in children and adolescents through limited, school-based programs that combine the promotion of healthy dietary habits and physical activity.

Goyal et.al., (2011) conducted a study on the determinants of Overweight and Obesity in Affluent Adolescent in Surat City, South Gujarat region. It was study to determine risk factors for overweight and obesity among affluent adolescent, in Surat city in south Gujarat. The participants were adolescents, 12 to 15 years of age. Data Pre-designed and pre-tested questionnaire was used to elicit the information about dietary history and physical activity. Height and weight was measured and BMI was calculated. Overweight and obesity were assessed by BMI for age. Student who had BMI for age >85th and <95th percentile of reference population were classified as overweight and BMI for age >95th percentile of reference population were classified as obese (IAP Growth Monitoring Guidelines for Children from Birth to 18 Year). The overall prevalence of obesity and overweight was 6.55% and 13.9% (boys: 6.7% and 15.1%; girl's 6.4% and 13.35%). Final model of multiple logistic regression analysis showed that important determinants of overweight and obesity were low levels of physical activity, watching television or playing computer games, and consuming junk foods, snacks and carbonated drinks. It was concluded that the magnitude of obesity and overweight among affluent adolescent of Surat city was found to be 6.55% and 13.9% respectively. The study implicated that low level of physical activity, watching TV or playing computer games, and dietary pattern predisposed the adolescent to overweight or obesity.

Manios et.al., (2011) conducted a study on the prevalence of overweight and obesity and investigate associated factors in a representative sample of Cretan school children. As part of a cross-sectional study in children aged 10–12 years (n = 481, 48% boys) in 27 (urban and rural) schools in Crete, Greece, the rates of overweight and obesity were estimated and multiple logistic regression was used to explore the relationship between several factors and body mass index (BMI). It was found that 28% and 13% of children were overweight and obese, respectively. Factors affecting children's BMI classification included: gender (95% CI: 0.21 to 0.56); birth weight (95% CI: 1.33 to 3.46); parental overweight or obesity (95% CI: 1.11 to 6.5 and 95% CI: 4.37 to 30.7 for one and both overweight or obese parents, respectively), paternal educational level (95% CI: 0.89 to 3.48 and 95% CI: 1.49 to 6.13 for low and high educational level, respectively); and cardiovascular fitness levels (95% CI: 0.87 to 0.92). The combined prevalence of overweight and obesity was alarmingly high in the current population (41%); several physiological, behavioral and social factors were shown to affect children's BMI status. It was concluded that the highlight the extent of the child obesity problem in Crete and support the need for actions to be taken at a national level to tackle the obesity epidemic.

Ray S et.al., (2011) conducted a study on Prevalence of pre hypertension in young military adults & its association with overweight & dyslipidaemia. The study included 767 participants (130 officers and 637 from other ranks). The blood pressure, serum triglycerides and serum cholesterol (total, HDL and LDL) were assessed along with anthropometric measurements such as height, weight, waist-hip ratio in apparently healthy military personnel. Information on smoking, alcohol intake, dietary habits and physical activity was collected using pretested questionnaire. Pre hypertension was defined as systolic blood pressure (SBP) 120-139 mm Hg and diastolic blood pressure (DBP) 80-89 mm Hg. It was found that the overall prevalence of pre hypertension was high (about 80%). The prevalence of other risk factors such as overweight (BMI>23 kg/m^2), serum total cholesterol > 200 mg/dl, serum LDL cholesterol > 130 mg/dl, serum HDL cholesterol <40 mg/dl, serum triglyceride > 150 mg/dl in the total group was 30, 22, 22, 67, and 14 per cent, respectively. Most of the personnel undertook moderate or heavy exercise. A significantly higher proportion of individuals with pre hypertension had clinical and behavioural risk factors such as

overweight, dyslipidaemia and adverse dietary practices like saturated fat and added salt intake. On multivariate logistic regression analysis, pre hypertension had significant positive association with BMI>23 kg/m^2 (OR 1.75), age (OR 1.89), serum triglyceride >150 mg/dl (OR 2.25) and serum HDL cholesterol <40 mg/dl (OR 1.51). It was concluded that the high prevalence of pre hypertension and its association with overweight and dyslipidaemia in this young, physically active military population indicates an urgent need for targeted interventions to reduce the cardiovascular risk.

Popko K et.al., (2010) conducted a study on cytokines Il-6 and TNF-α development of inflammation in obese subjects. The study included 80 obese subject (54 males and 26 females) BMI >25 kg/m⊃2. A control group consisted of 53 healthy subjects (24 males and 29 females) with BMI <25 kg/m⊃2. To determine the blood plasma concentration of IL-6 and TNF, commercial ELISA assay kits were used. It was found that the concentration of IL-6 was lower in the control compared with the obese patients, but a significance difference concerned only female subjects (P = 0.001). TNF-α concentration was significantly higher in all obese subjects (P<0.001). A higher level of this cytokine was also found in patients with obesity suffering from T2DM. A positive correlation was present between IL-6 and TNF-α concentration. Only did the IL-6 level correlate with the concentration of CRP in serum. It was concluded that the study confirmed that increased inflammatory cytokines lead to the persistence of inflammation in obese subjects. However, some other factors, such as gender, may contribute to the development of obesity-related inflammatory states.

Weiss E C et.al., (2006) conducted study on the Weight-control practices among US adults, 2001–2002. This analysis describes the use of specific practices by U.S. adults who tried to lose weight or tried only not to gain weight during the previous 12 months. Data were analyzed from the 2001–2002 National Health and Nutrition Examination Survey (NHANES) conducted on a nationally representative sample of the U.S. population. This study focused on adults aged 20 years or older who were both interviewed and examined (*n* =5027). Fifty-one percent of U.S. adults tried to control their weight in the previous 12 months, including those who tried to lose weight (34% of men, 48% of women) and those who tried only not to gain weight (11% vs 10%, respectively). Among 2051 adults who tried to control their

weight, the top four practices were the same: ate less food (65% among those who tried to lose weight, 52% among those who tried only not to gain weight); exercised (61% vs 46%, respectively); ate less fat (46% vs 42%); and switched to foods with lower calories (37% vs 36%). Less than one fourth combined caloric restriction with the higher levels of physical activity (300 or more minutes per week) recommended in the 2005 dietary guidelines by the U.S. Department of Health and Human Services and U.S. Department of Agriculture. It was concluded that weight control is a common concern; most people who try do not use recommended combinations of caloric restriction and adequate levels of physical activity.

Cartier A et.al., (2008) examined the relationships of two inflammatory cytokines, IL-6 and TNF-alpha, to visceral adiposity and indices of plasma glucose-insulin homeostasis. Plasma levels of IL-6 and TNF-alpha were measured in 189 untreated asymptomatic men (aged 43.7 +/- 7.8 year; body mass index 29.0 +/- 4.3 kg/m (2); waist girth 98.6 +/- 10.3 cm). It was found that Significant and positive associations were found between both cytokines with adiposity and adipose tissue distribution indices ($0.15 <$ or $= r < 0.32$; $P < 0.05$) as well as plasma glucose-insulin homeostasis variables ($0.22 <$ or $= r < 0.28$; $P < 0.05$). Comparison of two subgroups, each composed of 32 overweight men ($>$ or $=25$ kg/m(2)) with similar body mass index values (28.7 kg/m(2) in both groups) but with markedly different levels of visceral adipose tissue ($<$ vs. $>$ or $= 130$ cm(2)), revealed significant differences only for IL-6 levels (1.42 +/- 1.15 vs. 0.86 +/- 0.52 pg/ml; $P < 0.02$ for men with high vs. low visceral adipose tissue, respectively). Finally, when subjects were stratified on the basis of their respective concentrations of IL-6 and TNF-alpha (using the 50th percentile of their overall distribution), an ANOVA revealed an independent contribution of IL-6 to the variation of fasting insulin ($P < 0.01$) and each of these two cytokines to the variation of insulin levels measured after a 75-g oral glucose challenge ($P < 0.01$ for IL-6 and $P < 0.05$ for TNF-alpha). It was concluded that the IL-6 appeared to be clearly associated with visceral adiposity, TNF-alpha rather showed associations with indices of total body fatness. Thus, TNF-alpha may contribute to the insulin resistance of overall obesity, whereas IL-6 may be one of the mediators of the hyperinsulinemia state specifically related to excess visceral adiposity.

Keaney JF et.al., (2003) conducted a study on Obesity and systemic oxidative stress: clinical correlates of oxidative stress in the Framingham Study. We examined 2828 subjects from the Framingham Heart Study and measured urinary creatinine indexed levels of 8-epi-PGF2alpha as a marker of systemic oxidative stress. Age- and sex-adjusted multivariable regression models were used to assess clinical correlates of oxidative stress. In age- and sex-adjusted models, increased urinary creatinine-indexed 8-epi-PGF2alpha levels were positively associated with female sex, hypertension treatment, smoking, diabetes, blood glucose, body mass index, and a history of cardiovascular disease. In contrast, age and total cholesterol were negatively correlated with urinary creatinine-indexed 8-epi-PGF2alpha levels. After adjustment for several covariates, decreasing age and total/HDL cholesterol ratio, sex, smoking, body mass index, blood glucose, and cardiovascular disease remained associated with urinary 8-epi-PGF2alpha levels. It was concluded that the Smoking, diabetes, and body mass index were highly associated with systemic oxidative stress as determined by creatinine-indexed urinary 8-epi-PGF2alpha levels. The effect of body mass index was minimally affected by blood glucose and diabetes and may suggest an important role of oxidative stress in the deleterious impact of obesity on cardiovascular disease.

Deng G et.al., (2010) conducted a study on the Adiponectin directly improves endothelial dysfunction in obese rats through the AMPK-eNOS pathway. Male Sprague-Dawley rats were fed with a regular or a high-fat diet for 6 weeks. The aorta was isolated, and vascular segments were incubated with vehicle or the globular adiponectin (globular domain (gAD); 2 mg ml(-1)) for 2 h. The effect of gAD on endothelial function and nitric oxide (NO) production was determined. Human aortic endothelial cells in primary culture were treated with vehicle or gAD (4 mg ml (-1)). The effect of gAD on the level of phosphorylation of endothelial nitric oxide syntheses (eNOS) at Ser1177, AMPK at Thr176 and Akt at Ser473 in endothelial cells were determined. It was found that the severe endothelial dysfunction was observed in high-fat diet fed rat aortic segments. After gAd incubation, the endothelium-dependent relaxation was partly improved and total production of nitric oxide as result of enhanced eNOS activity was also increased. In the cultured endothelial cell line HUVEC, globular adiponectin increased the activity of eNOS through activating

AMPK by stimulating its phosphorylation at Thr176 but not Akt. It was concluded that the demonstration in the current study that adiponectin reverses endothelial dysfunction through increasing NO production by eNOS phosphorylation, and decreasing NO inactivation by blocking superoxide production provides a new direction in the prevention of vascular injury in the obesity population.

Uretsky S et.al., (2007) conducted a study on the Obesity paradox in patients with hypertension and coronary artery disease. A total of 22,576 hypertensive patients with coronary artery disease (follow-up 61,835 patient years, mean age 66+/-9.8 years) were randomized to a verapamil-SR or atenolol strategy. Dose titration and additional drugs (trandolapril and/or hydrochlorothiazide) were added to achieve target blood pressure control according to the Sixth Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure targets. Patients were classified into 5 groups according to baseline BMI: less than 20 kg/m2 (thin), 20 to 25 kg/m2 (normal weight), 25 to 30 kg/m2 (overweight), 30 to 35 kg/m2 (class I obesity), and 35 kg/m2 or more (class II-III obesity). The primary outcome was first occurrence of death, nonfatal myocardial infarction, or nonfatal stroke. It was found that the patients of normal weight (BMI 20 to<25 kg/m2) as the reference group, the risk of primary outcome was lower in the overweight patients (adjusted hazard ratio [HR] 0.77, 95% confidence interval [CI], 0.70-0.86, P<.001), class I obese patients (adjusted HR 0.68, 95% CI, 0.59-0.78, P<.001), and class II to III obese patients (adjusted HR 0.76, 95% CI, 0.65-0.88, P <.001). Class I obese patients had the lowest rate of primary outcome and death despite having smaller blood pressure reduction compared with patients of normal weight at 24 months (-17.5+/-21.9 mm Hg/-9.8+/-12.4 mm Hg vs -20.7+/-23.1 mm Hg /-10.6+/-12.5 mm Hg, P<.001). It was concluded that the population with hypertension and coronary artery disease, overweight and obese patients had a decreased risk of primary outcome compared with patients of normal weight, which was driven primarily by a decreased risk of all-cause mortality. Our results further suggest a protective effect of obesity in patients with known cardiovascular disease in concordance with data in patients with heart failure and those undergoing percutaneous coronary intervention.

Peralta et.al., (2009) conducted study on assessed the feasibility, acceptability, and potential efficacy of a school-based obesity prevention program among adolescent boys with sub-optimal cardio respiratory fitness. In 2007, a 6-month, 2-arm parallel group, randomized controlled pilot trial was conducted in a single school setting (Sydney, Australia). Thirty-three 7th Grade boys (mean age=12.5+/-0.4 years) were randomly assigned to intervention (n=16) or active comparison group (n=17). The intervention consisted of one 60-minute curriculum session and two 20-minute lunchtime physical activity session per week. The active comparison group continued with their usual physical activity curriculum sessions (Friday afternoons 2-3 pm). The pilot trial's curriculum sessions were BMI, and secondary outcomes included waist circumference, percentage body fat, cardio respiratory fitness, objectively measured physical activity and small screen recreation time. At follow-up, compared with boys in the active comparison group, boys in the intervention group displayed a smaller increase in BMI; greater reduction in waist circumference; percentage body fat and time spent in small screen recreation on weekends; and a greater increase in cardio respiratory fitness; and participation in total weekday physical activity.

Aguilar-Salinas CA et.al., (2008) studied the metabolically healthy obese phenotype was found in 38 men and 133 women. A cross-sectional analysis was performed of a cohort of obese and non-obese subjects aged 18-70 years. A medical history was taken and glucose, plasma lipids, and total adiponectin were measured. This is defined as a body mass index (BMI) above 30 kg/m (2) plus high-density lipoprotein cholesterol of at least 40 mg/dl in the absence of type 2diabetes and arterial hypertension. It was found that Twenty percent of the cases with a BMI above 40 kg/m (2) had adiponectin concentrations above the median value of normal BMI subjects. Adiponectin levels above 12.49 mg/liter in obese women (odds ratio, 3.02; 95% confidence interval, 1.95-4.67; $P < 0.001$) and above 8.07 mg/liter in obese men (odds ratio, 2.14; 95% confidence interval, 1.1-4.06; $P = 0.01$) increased the probability of being metabolically healthy. The association remained significant (beta, 0.673 +/- 0.205, $P < 0.001$) in a logistic regression model ($r (2) = 0.25$, $P < 0.001$) after controlling for the confounding effect of age, insulin, and waist circumference. It was concluded that the certain obese individuals have adiponectin levels similar to

those found in normal BMI subjects; this is associated with the metabolically healthy obese phenotype.

Kovacs et.al., (2009) conducted a study on the effect of school-based exercise training (ET) without dietary intervention, on body composition, fitness and cardiovascular risk in overweight/obese children. Subject were 51 overweight/obese 6.5-to 12.5-year old children (23 boys, 28 girls; BMI 25.6+-4.3 kg/m2), of whom 48 completed the program. Participants were enrolled in a 15-week aerobic training (three 60-minute session / week). Working heart rate was between 120-185 beats/minute. Participation rate was 87%. BMI, waist circumference, body composition (bio-impedance), aerobic capacity (treadmill), blood pressure, lipids and insulin sensitivity (HOMA) were assessed. Waist circumference, muscle mass, maximal oxygen consumption and systolic blood pressure improved significantly. Number of children with abdominal obesity (29 vs. 20), hypertension (10 vs. 5) and elevated triglyceride (18 vs. 14) also declined significantly over time. It was concluded that as a result of high attendance and appropriate training program, cardio vascular fitness and abdominal obesity improved in overweight/obese children along with the improvement in metabolic risk factor profile.

Wildman RP et.al., (2008) conducted a study on obese without cardio metabolic risk factor clustering and the normal weight with cardio metabolic risk factor clustering: prevalence and correlates of 2 phenotypes among the US population (NHANES 1999–2004). The prevalence and correlates of combined body mass index (normal weight, < 25.0; overweight, 25.0-29.9; and obese, > or = 30.0 [calculated as weight in kilograms divided by height in meters squared]) and cardio metabolic groups (metabolically healthy, 0 or 1 cardio metabolic abnormalities; and metabolically abnormal, > or = 2 cardio metabolic abnormalities) were assessed in a cross-sectional sample of 5440 participants of the National Health and Nutrition Examination Surveys 1999-2004. Cardio metabolic abnormalities included elevated blood pressure; elevated levels of triglycerides, fasting plasma glucose, and C-reactive protein; elevated homeostasis model assessment of insulin resistance value; and low high-density lipoprotein cholesterol level. It was found that US adults 20 years and older, 23.5% (approximately 16.3 million adults) of normal-weight adults were

metabolically abnormal, whereas 51.3% (approximately 35.9 million adults) of overweight adults and 31.7% (approximately 19.5 million adults) of obese adults were metabolically healthy. The independent correlates of clustering of cardio metabolic abnormalities among normal-weight individuals were older age, lower physical activity levels, and larger waist circumference. The independent correlates of 0 or 1 cardio metabolic abnormalities among overweight and obese individuals were younger age, non-Hispanic black race/ethnicity, higher physical activity levels, and smaller waist circumference. It was concluded that US adults, there is a high prevalence of clustering of cardio metabolic abnormalities among normal-weight individuals and a high prevalence of overweight and obese individuals who are metabolically healthy. Further study into the physiologic mechanisms underlying these different phenotypes and their impact on health is needed.

Sharpe P A et.al., (2007) conducted a study on use of complementary and alternative medicine for weight control in the United States. A list-assisted random-digit-dialled telephone survey of adults was conducted in the fall of 2002 (n = 11,211). The focus of the study was complementary and alternative medicine (CAM) use, other than dietary supplements, in the previous 12 months. The sample of respondents was drawn from the total non institutionalized U.S. adult population residing in telephone-equipped locations. The sampling procedures were designed to obtain adequate representation of Hispanic and non-Hispanic black respondents. Data from the total sample of 11,211 were weighted to achieve an estimate of the U.S. population. Analyses focused on 372 people who had used CAM within the previous 12 months. It was found that the total, 3.3% (n = 372) had used a CAM therapy in the previous 12 months. Higher adjusted odds ratios for CAM use were found among respondents who were exercising for weight control; using a lower carbohydrate, higher protein diet; using a non-prescription weight-loss product(s); overweight; physically active; and not satisfied with one's body (adjusted for age, race, gender, education, and city size). The most often used therapies were yoga (57.4%), meditation (8.2%), acupuncture (7.7%), and massage (7.5%), and Eastern martial arts (5.9%). CAM users used CAM therapies on their own (62.6%), in a group setting (26.8%) or with a CAM practitioner (10.6%). It was concluded that the use of CAM therapies other than dietary supplements for weight loss was relatively low. The most

popular therapy was yoga, and the majority of CAM users used CAM therapies on their own. Persons who had used other weight loss methods had greater odds for using CAM in the previous 12 months, suggesting that CAM use is often added to other weight-loss strategies.

Koley et.al., (2009) established the relationship between obesity and lumber range of motion in 300 randomly selected normal, healthy school going children (150 boys and 150 girls) aged 6-15 years of Amritsar, Punjab, India. Height, weight, body mass index (BMI), percent body fat, percent lean body mass, lumber flexion, lumber extension and lumber lateral flexion were measured on all the subjects following the standard techniques. The findings of the study indicate highly significant negative correlations both in boys and girls, between BMI and lumber flexion (r=-0.528 and -0.393), lumbar extension (r=-0.339 and -0.471 respectively) and lumber lateral flexion (r=-0.421 and -0.318 respectively), between percent body fat and lumber flexion (r=-0.393 and -0.247 respectively), lumber extension (r=-0.221 and -0..413 respectively) and with lumber lateral flexion (r=-0.340 in boys only). It was concluded that obesity in terms of BMI and percent body fat has some strong association with lumber range of motion in the studied samples.

Stefan N et.al., (2008) conducted a study on identification and characterization of metabolically benign obesity in humans. In 314 subjects, we measured total body, visceral, and subcutaneous fat with magnetic resonance (MR) tomography and fat in the liver and skeletal muscle with proton MR spectroscopy. Insulin sensitivity was estimated from oral glucose tolerance test results. Subjects were divided into 4 groups: normal weight (body mass index [BMI] [calculated as weight in kilograms divided by height in meters squared], < 25.0), overweight (BMI, 25.0-29.9), obese-insulin sensitive (IS) (BMI, > or = 30.0 and placement in the upper quartile of insulin sensitivity), and obese-insulin resistant (IR) (BMI, > or = 30.0 and placement in the lower 3 quartiles of insulin sensitivity). It was found that Total body and visceral fat were higher in the overweight and obese groups compared with the normal-weight group (P < .05); however, no differences were observed between the obese groups. In contrast, ectopic fat in skeletal muscle (P < .001) and particularly the liver (4.3% +/- 0.6% vs 9.5% +/- 0.8%) and the intima-media thickness of the

common carotid artery (0.54 +/- 0.02 vs 0.59 +/- 0.01 mm) were lower and insulin sensitivity was higher (17.4 +/- 0.9 vs 7.3 +/- 0.3 arbitrary units) in the obese-IS vs the obese-IR group (P < .05). Unexpectedly, the obese-IS group had almost identical insulin sensitivity and the intima-media thickness was not statistically different compared with the normal-weight group (18.2 +/- 0.9 AU and 0.51 +/- 0.02 mm, respectively). It was concluded that metabolically benign obesity that is not accompanied by insulin resistance and early atherosclerosis exists in humans. Furthermore, ectopic fat in the liver may be more important than visceral fat in the determination of such a beneficial phenotype in obesity.

Knopfli et.al., (2008) evaluated the gender difference of an 8-week multidisciplinary inpatient program on body weight, body composition, aerobic fitness, and quality of life of severely obese children and adolescents. Body weight was measured daily, and body composition, aerobic fitness, and quality of life were measure at the beginning and the end of an 8-week multidisciplinary inpatient program in 130 severely obese patients (52 girls, 78 boys), median (25th, 75th percentile) age of 13.8 years, median body weight of 89.4 kg, and a body mass index of 33.4 kg/m², which is well above the 98th percentile. The inpatient program was based on a multidisciplinary treatment and education program that focused on daily physical activity, a 1200-1600 kcal/day balanced nutrition regimen, and a behavior modification therapy. At the end of the program all patients had lost a significant amount of body weight, absolute body fat girls and absolute fat free (or lean body) mass. It was concluded that multidisciplinary inpatient treatment program including moderate calorie restriction, daily physical activity, and an increase in aerobic fitness as well as the quality of life of severely obese children and adolescents.

Ziccardi P et.al., (2002) conducted a study on the Reduction of inflammatory cytokine concentrations and improvement of endothelial functions in obese women after weight loss over one year. Fifty-six healthy premenopausal obese women (age range 25 to 44 years, body mass index 37.2+/-2.2, waist to hip ratio range 0.78 to 0.92) and 40 age-matched normal weight women were studied. Compared with non-obese women, obese women had increased basal concentrations of tumour necrosis factor-alpha (TNF-alpha, P<0.01), interleukin-6 (IL-6, P<0.01), P-selectin (P<0.01),

intercellular adhesion molecule-1 (ICAM-1, P<0.02), and vascular adhesion molecule-1 (VCAM-1, P<0.05). Vascular responses to L-arginine (3 g IV), the natural precursor of nitric oxide, were impaired in obese women: reductions in mean blood pressure (P<0.02), platelet aggregation to adenosine diphosphate (P<0.05), and blood viscosity (P<0.05) were significantly lower as compared with those in the non-obese group. Concentrations of TNF-alpha and IL-6 were related (P<0.01) to visceral obesity, as well as to adhesion levels and responses to L-arginine. After 1 year of a multidisciplinary program of weight reduction (diet, exercise, behavioural counselling), all obese women lost at least 10% of their original weight (9.8+/-1.5 kg, range 7.5 to 13 kg). Compared with baseline, sustained weight loss was associated with reduction of cytokine (P<0.01) and adhesion (P<0.02) concentrations and with improvement of vascular responses to L-arginine. It was concluded that obese women, endothelial activation correlates with visceral body fat, possibly through inappropriate secretion of cytokines. Weight loss represents a safe method for down regulating the inflammatory state and ameliorating endothelial dysfunction in obese women.

Phetla M C and Skaal L (2017) conducted a study on perceptions of healthcare professionals regarding their own body weight in selected public hospitals in Mpumalanga Province. The study design was a cross-sectional survey. A total of 210 HCWs were sampled. Data were collected using self-administered questionnaires. Anthropometric measurements such as weight and height were objectively measured and body mass indices (BMIs) were calculated. It was found that the 210 participants, the majority (82.4%) were female (Table 1). The participants' ages ranged from 21 years to 63 years (mean 37.8, median 37.0, standard deviation 9.247). The majority (63.8%) of the participants were ≤40 years of age. The majority of the participants were not married (64.3%), were black (83.8%) and were nurses (69.5%), and close to half (47.6%) were living in urban areas; 56.2% reported that they participated in physical activity other than that involved in their normal daily routine. All data were coded and entered into SPSS version 20.0 (USA) for analysis. Descriptive statistics were used to analyse the frequencies, correlations and means. It was concluded that HCWs misclassify their own body weight, which is a risk factor for obesity. It is important to focus on the health of this group of workers, on whom the health of

South Africans depends and who should be the drivers of healthy living for all. Correct classification of their own body weight will encourage people to take action in a bid to combat their own and others' obesity.

Gele Aet.al., (2013) assessed the prevalence of overweight and obesity among Somali immigrants in Oslo. A cross-sectional study involving 208 respondents aged 25 and over was conducted among Somali immigrants in Oslo, using a structured questionnaire. The mean BMI for females and males were 27.4 and 23.6, respectively. Similarly, 53% of women and 28% of men were abdominally obese. In a logistic regression analysis, both generalized and abdominal obesity were significantly associated with increasing duration of residence in Norway, and with being less physically active. Public health policymakers should facilitate an environment that enables Somali immigrants, particularly women, to lead healthy lifestyles. In this time of epidemiological transition, health education in the areas of physical exercise and healthy eating should be a major focus for working with new immigrants.

Chen SB et.al., (2009) conducted a study on the Serum C-reactive protein and white blood cell count in morbidly obese surgical patients. The study was a prospectively controlled clinical study. From December 1, 2001 to January 31, 2006, of 640 (442 females and 198 males) consecutive morbid obese patients enrolled in a surgically supervised weight loss program with at least 1 year's follow-up were examined. It was found that the patients, 476 (74.4%) had elevated CRP and 100 (15.6%) had elevated WBC at preoperative study. CRP and WBC were significantly related and both increased with increasing body mass index (BMI). CRP is also increased with increasing waist, glucose level, haemoglobin, albumin, Ca, insulin, C-peptide, and metabolic syndrome while WBC is increased with metabolic syndrome but decreased with increasing age. Multivariate analysis confirmed fasting glucose level and haemoglobin are independent predictors of the elevation of CRP while age is the only independent predictor for elevated WBC. Both WBC and CRP levels decreased rapidly after obesity surgery. These improvements resulted in a 69.8% reduction of CRP and 26.4% reduction of WBC 1 year after surgery. Although individuals who underwent laparoscopic gastric bypass lost significantly more weight (36.8 +/- 11.7 kg vs. 17.3 +/- 10.8 kg; p = 0.000) and achieved a lower BMI (27.8 +/-

4.6 vs. 35.0 +/- 5.5; p = 0.000) than individuals who underwent laparoscopic gastric banding, there was no difference in the resolution of elevated CRP 1 year after surgery (95.9% vs. 84.5%; p = 0.169) and WBC (99.4% vs. 98.3%; p = 0.323). It was concluded that the both baseline WBC and CRP are elevated in morbid obese patients but CRP has a better clinical significance. It was concluded that significant weight reduction 1 year after surgery markedly reduced CRP and WBC with a resolution rate of 93.9% and 98.2% separately. Obesity surgery performed by laparoscopic surgery is recommended for obese patients with elevated CRP or WBC.

Pasarica M et.al., (2009) conducted a study on reduced adipose tissue oxygenation in human obesity evidence for rarefaction, macrophage chemotaxis, and inflammation without an antigenic response. The Oxygen partial pressure (AT pO_2) and AT temperature in abdominal AT (9 lean and 12 overweight/obese men and women) was measured by direct insertion of a polarography Clark electrode. Body composition was measured by dual-energy X-ray absorptiometry, and insulin sensitivity was measured by hyperinsulinemic-euglycemic clamp. Abdominal subcutaneous tissue was used for staining, quantitative RT-PCR, and chemokine secretion assay. It was found that the AT pO_2 was lower in overweight/obese subjects than lean subjects (47 ± 10.6 vs. 55 ± 9.1 mmHg); however, this level of pO_2 did not activate the classic hypoxia targets (pyruvate dehydrogenase kinase and vascular endothelial growth factor [VEGF]). AT pO_2 was negatively correlated with percent body fat ($R = -0.50, P < 0.05$). Compared with lean subjects, overweight/obese subjects had 44% lower capillary density and 58% lower VEGF, suggesting AT rarefaction (capillary drop out). This might be due to lower peroxisome proliferator–activated receptor $\gamma1$ and higher collagen VI mRNA expression, which correlated with AT pO_2 ($P < 0.05$). Of clinical importance, AT pO_2 negatively correlated with CD68 mRNA and macrophage inflammatory protein 1α secretion ($R = -0.58, R = -0.79, P < 0.05$), suggesting that lower AT pO_2 could drive AT inflammation in obesity. It was concluded that the adipose tissue rarefaction might lie upstream of both low AT pO_2 and inflammation in obesity. These results suggest novel approaches to treat the dysfunctional AT found in obesity.

Napoé GS et.al., (2013) determined the prevalence of obesity among patients in a Togolese cardiology clinic and determine predictors of reporting AWL and physician advice for weight loss. We recruited French-speaking men and women, aged > or = 18 years from this academic cardiology clinic to complete a questionnaire and anthropometric measurements. Among 135 patients, 33% were overweight and 24% were obese. Among overweight and obese patients (n = 76), logistic regression was used to calculate odds ratios (OR) for predictors of AWL and physician advice. 53% reported AWL and 49% received physician advice. Obese participants were 11 times more likely than overweight participants to report AWL (OR = 11.14; P < .0001). AWL was more common in those reporting physician advice (OR = 7.58; P = .0001) and women (OR = 2.78; P = .04). Obesity and female sex were also associated with reporting physician advice to lose weight. Age and education were not associated with AWL or physician advice. Physician advice highly correlates with AWL; however only half of participants received it. Physicians should make efforts to incorporate weight loss advice in their routine care.

Clerk LH et.al., (2006) conducted a study on obesity blunts insulin-mediated microvascular recruitment in human forearm muscle. This facilitates glucose and insulin delivery to muscle, thus augmenting glucose uptake. In obese rats, both insulin-mediated micro vascular recruitment and glucose uptake are diminished; however, this action of insulin has not been studied in obese humans. Here we used contrast ultrasound to measure micro vascular blood volume (MBV) (an index of micro vascular recruitment) in the forearm flexor muscles of lean and obese adults before and after a 120-min euglycemic-hyperinsulinemic (1 mU . min(-1) . kg(-1)) clamp. We also measured brachial artery flow, fasting lipid profile, and anthropomorphic variables. Fasting plasma glucose (5.4 +/- 0.1 vs. 5.1 +/- 0.1 mmol/l, P = 0.05), insulin (79 +/- 11 vs. 38 +/- 6 pmol/l, P = 0.003), and percent body fat (44 +/- 2 vs. 25 +/- 2%, P = 0.001) were higher in the obese than the lean adults. After 2 h of insulin infusion, whole-body glucose infusion rate was significantly lower in the obese versus lean group (19.3 +/- 3.2 and 37.4 +/- 2.6 mumol . min(-1). kg(-1) respectively, P < 0.001). Compared with baseline, insulin increased MBV in the lean (18.7 +/- 3.3 to 25.0 +/- 4.1, P = 0.019) but not in the obese group (20.4 +/- 3.6 to 18.8 +/- 3.8, NS). Insulin increased brachial artery diameter and flow in the lean but

not in the obese group. It was found that significantly negative correlation between Delta MBV and BMI (R = -0.482, P = 0.027) in response to insulin. It was concluded that obesity eliminated the insulin-stimulated muscle micro vascular recruitment and increased brachial artery blood flow seen in lean individuals.

Son N (2017) conducted a study on assessment of body perception, Psychological Distress, and Subjective Quality of Life among Obese and Non obese Subjects in Turkey.494 subjects, aged between 18 and 64 years, were included to the study. Patients with the body mass index (BMI) of ≥18.5–24.9 kg/m² were assigned to the control group; BMI ≥ 30 kg/m² were assigned to the obese patient group. An ethical committee approval with protocol No. of 2011/242 was obtained from the Ethical Committee of Eskişehir Osmangazi University Faculty of Medicine. Interviews were performed two times with obese subjects in the 1st and the 6th month of weight loss program, once with the control group. Data identification form, the form which included the biochemical parameters, Trait Anxiety inventory, and State anxiety scale, Quality of Life scale Short Form [(SF-36 (QOL), Multidimensional Body-Self Relations Questionnaire (MBSRQ), Zung Depression Rating Scale, and Zung Anxiety Rating Scale were applied to participants. It was found that the obesity was more common in women. Obesity reduces the quality of life, negatively affects body perception, and triggers anxiety. Because of their body structure, obese individuals are exposed to social pressure and unethical attitudes. All data analyses were performed by using PASW Statistics 18.Hence the hypothesis was accepted at 0.05 Level of confidence. It was concluded that both health risks and social implications of obesity are important. Further studies are needed to ethically evaluate the psycho-social problems caused by obesity.

Sengupta P et.al., (2014) conducted a study on screening obesity by Direct and Derived Anthropometric Indices with evaluation of physical efficiency among female college students of Kolkata. This small-scale cross-sectional study conducted in randomly selected 100 female students of different colleges of Kolkata with the age of 18-22 [mean age 20.4 (2.3)] years. Measurements of body composition included total 24 variables, with thirteen direct and eleven derived anthropometric variables; while physical efficiency parameters were physical fitness index, VO2max, energy

expenditure and anaerobic power. The data of the experimental group were compared with those of the control group by "t" test, using SPSS v.15.0 and MS-Excel v.2013. It was found that the   analysis of collected data showed majority of the students have normal range of BMI (67.95%), but, 21.95% of students found to be overweight and 3.84% are obese. They also showed higher fat mass [14.40 (4.11)], but, lower waist to hip ratio and tonicity index. They were found to have poor to moderate physical fitness [57.60 (3.90)] and higher energy expenditure [5.61 (0.72)]. It was concluded that the present obesity screening reports almost one of four female students (24 out of 100 participants) are overweight/obese, indicated higher body fat distribution and increased propensity of being obese with age. Thus, the overall data along with their low physical fitness points out to health risks among female undergraduates of Kolkata.

Pallav Sengupta and Sobhana Sahoo (2014) conducted a study on the health-related morphological characteristics and physiological fitness in connection with nutritional, socio-economic status, occupational workload of tea garden workers. Subjects were divided into control and tea garden workers groups. Height and weight were measured and the body mass index (BMI) was computed. Physiological parameters such as resting heart rate, blood pressure, fitness variables like physical fitness index (PFI), energy expenditure (EE), handgrip strength and anthropometric parameters like mid-upper arm (MUAC), thigh circumference (TC), head circumference (HC) and waist-to-hip ratio (WHR) were measured. It was found that body surface area (BSA), BMI, body fat percentage and fitness variables (PFI, EE) showed significant difference (p<0.05) between the two groups. Anthropometric measures (MUAC, TC, HC and WHR) reflected poor status among labourers. It was concluded that the present study shows that the majority of workers had ectomorph stature, good physical fitness, but had poor nutritional status (BMI and WHR).

Ngoga E et.al., (2009) conducted a study on outcome of pregnancy in the morbidly obese woman. A case control study design was used. In this study a normal BMI was defined as 20–25 kg/m2 and morbid obesity as a BMI of ≥ 40 kg/m2 . The BMI was calculated from the weight and height measured at the booking visit. The cases in this study comprised the first hundred morbidly obese women seen at the

Obstetric Special Care Clinic in Tygerberg Hospital (TBH), a secondary and tertiary referral centre. The controls (n = 209) were women with normal BMIs and singleton pregnancies who booked as low-risk patients at the Bishop Lavis Midwife Obstetric Unit (MOU) during the same calendar period. A minimum ratio of 2:1 controls-to-case was used, with controls also matched for prime- or multi parity. Patients booking at the MOU with significant obstetric risk factors are referred to TBH for antenatal care. These women were not considered as controls. However, low-risk women who met the inclusion criteria at booking and who subsequently developed risks or complications were included, as the selection was done according to findings at the booking visit. The main outcomes to be determined were: ante-, intra- and postpartum maternal complications, rate of epidurals, and prenatal outcomes. It was found that women in the morbidly obese group were significantly older ($p < 0.001$) and of higher parity ($p < 0.001$) than those with normal BMIs. There was no difference in the numbers of prim gravidae. Significantly more women in the morbidly obese group had experienced at least one miscarriage ($p = 0.002$). In similar fashion, significantly more of the previous deliveries in the morbidly obese group had been by caesarean section ($p < 0.001$). Again, significantly more women in the morbidly obese group had previously experienced pregnancies complicated by hypertension ($p < 0.001$). In the index pregnancies studied, morbidly obese women experienced more hypertension ($p < 0.001$), diabetes ($p = 0.02$) and urinary tract infections ($p < 0.001$) than controls. They underwent induction of labour more often ($p < 0.001$) and had a higher rate of caesarean delivery ($p < 0.001$). Epidural anesthesia was planned for all morbidly obese patients, but only 14% received it. During delivery, perineal damage was more common in morbidly obese women ($p < 0.001$) and their babies were significantly larger ($p < 0.001$). There was one prenatal death. It was concluded that morbidly obese women experienced increased complications during pregnancy and childbirth. Due to the high rate of caesarean sections and the potential difficulties of emergency anesthesia among these women, epidural anesthesia during labour should be planned and administered as often as possible.

YakongV N et.al., (2015) found that Obesity and hypertension among market men and women in the Tamale metropolis.A total of 220 market men and women were contacted. 15 individuals refused to take part in the study and 5 returned

incomplete questionnaires, leaving 200 complete and evaluable respondents comprising 100 men and 100 women. The study population was selected randomly from four major markets in the city. Obesity was measured using the various anthropometric parameters (BMI, WHR, WC and %BF) and blood pressure was measured. The prevalence of hypertension was 3% while the prevalence of obesity was 25.0%, 35.5%, 30.0% and 52.5% using BMI, WHR, WC and %BF respectively among the entire study population. Among the men, 27.0%, 8.0%, 8.0% and 37.0% were obese using BMI, WHR, WC and %BF respectively; whilst the women recorded 23.0%, 63.0%, 52.0% and 68.0% as the prevalence of obesity using BMI, WHR, WC and % BF respectively. Among the men, 5.0% were hypertensive while 1.0% of women had hypertension. Prevalence of obesity and Blood pressure values increased with increase in age. The prevalence of obesity is a common phenomenon among the market men and women in the metropolis. Irrespective of the criteria used, obesity is more common among the market women. The prevalence of obesity from this study is age dependent; it also depends on educational level as well as marital status. The prevalence of hypertension on the other hand is low and it is common among the men as compared to the women and also increased with age. It was concluded that education on hypertension and obesity should be prioritized among the market men and women as a greater proportion of our study population who were obese were found to be illiterates.

Skaal L and Pengpid S (2011) conducted a study on obesity and health problems among South African healthcare workers. A questionnaire was distributed to 200 respondents from a balanced pool of randomly selected HCW (100 medical staff and 100 nonmedical staff). Self-reported body mass index (BMI), obesity-related health problems and perceptions about body weight were assessed. It was found that seventy-three per cent of the HCW were overweight or obese, and half of them had never tried to lose weight. Females and older HCW were more obese than men and younger counterparts. There was no difference in BMI distribution between medical and nonmedical staff. About one-third of HCW reported that they suffered from obesity-related non communicable diseases (NCDs; hypertension 20% and diabetes 10%) and stress (32.5%). The majority of HCW had an inaccurate perception of their own weight. It was concluded that South African HCW have a high prevalence of

obesity-related NCDs. A health promotion programme targeting HCW is urgently needed to encourage weight control, urge the prevention of obesity-related NCDs and change self-perceptions of body weight, in order to improve their own health and make them better role models for the general public.

Mogre V et.al., (2014) conducted a study on factors associated with central overweight and obesity in students attending the University for Development Studies in Tamale, Ghana: a cross-sectional study. A cross-sectional study design was employed. A sample of 552 students was randomly selected to participate. Waist and hip circumference was measured with appropriate tools and computed into a waist-to-hip ratio (WHR). Demographic and socio-cultural factors, such as age, sex, smoking status and coffee and alcohol consumption, were recorded. Physical activity was assessed using the World Health Organization Global Physical Activity Questionnaire. It was found that generally, 29.3% of the participants had a normal WHR (44.1% males, 3.0% females). 60.9% (55.9% males, 69.7% females) were centrally overweight and 9.8% (0.0% males, 27.3% females) centrally obese. Age and smoking status were not associated with central overweight and obesity. Being female was significantly associated with a higher prevalence of central obesity. The prevalence of central obesity was 13.9% in non-coffee drinkers, 6.7% in coffee drinkers, 11% in non-alcohol drinkers and 0% in alcohol drinkers. Almost 95% of centrally obese participants engaged in light or moderate physical activity and 5.6% in vigorous physical activity (p-value < 0.0001). Conversely, 55% of normal weight participants engaged in light or moderate physical activity and 44% in vigorous physical activity (p-value 0.0008). It was concluded that physical activity, female gender, alcohol and coffee consumption were associated with central obesity.

KutluR and CihanFG (2016) conducted a study on comparison of the body compositions in obese and non-obese individuals. This cross sectional study was constituted of 428 individuals between October 2012 and February 2014. The study population was chosen randomly from the patients who applied with any problem to Family Medicine Outpatient Clinic. At first, the female and male subjects were matched according to their ages and weights. After calculating their body mass indexes (BMIs), the participants were categorized as non obese and obese. It was

found that participants, 300 (70.1%) were female. The prevalence of overweight and obesity was 30.8% and 47.7%, respectively. Having low educational level, female gender, not working, being married, and non-smoker significantly increased more in obese than non-obese (P < 0.001). Total body water, visceral fat accumulation, body mass index, resting metabolic rate, fat free mass, bone mass, and muscle mass were significantly higher in obese when compared to those with non-obese (P < 0.001). Thirteen percent of the participants were thinking of changing their diet and lifestyle to lose weight at the beginning. After learning their body compositions, the rate increased to 60% who decided to modify their lifestyle and asked for help to lose weight. This behaviour change was significant in especially the over weighted participants (P = 0.025). Statistical analyses were carried out using the SPSS version 20.0 (SPSS Inc, Chicago, IL, USA). Descriptive statistics were used to present subject characteristics. It was concluded that changes in body composition are associated with obesity and increased risk for certain cancers, cardiovascular disease, type 2 diabetes mellitus. Learning the health risks can motivate losing weight. Multi cantered studies can be illuminating different cultural factors about obesity.

Amole I O and OlaOlorun DA (2010) conducted a study on lipid profile of adult Nigerians attending medical outpatient clinic of Baptist medical centre Ogbomosho. A cross-sectional descriptive study of 400 adults aged 18 years and above was carried out. Participants were administered a standardized questionnaire and had measurements of waist circumference and serum lipids taken. It was found that Four hundred subjects were randomly selected (221 females and 179 males) with a mean age of 48.65 ± 16.56 years. The mean total cholesterol, LDL- cholesterol, Triglycerides and HDL-cholesterol were 3.78 ± 1.07 mmol/L, 1.18 ± 1.02 mmol/L, 0.97 ± 0.58 mmol/L and 2.15 ± 0.86 mmol/L respectively. The prevalence of abdominal obesity among the study population was 33.75%. The subjects who had abdominal obesity had the highest mean values for total cholesterol, triglycerides, LDL-cholesterol and HDL-cholesterol. The mean values of total cholesterol, HDL-cholesterol, triglycerides and LDL-cholesterol obtained among the physically inactive subjects were higher than those of the subjects who were physically active. It was concluded that higher mean values for total cholesterol, triglycerides and LDL,

cholesterol were found among the subjects who had abdominal obesity and those who were physically inactive in Ogbomosho.

2.5 SUMMARY OF RELATED LITERATURE

The investigator reviewed related literature on studies pertaining to yogic practices and moderate physical activities on physiological, biochemical and psychological variables from various sources like books, journals, websites and guidance from experts.

The reviews are presented as studies to yogic practices with dependent variables (n=24), studies related to yogic practices and Moderate physical activities (n=44) and studies related to obesity with dependent variables (n=42). All the research studies that are presented in this section prove that yogic practices and moderate physical activities contribute significantly for better improvement in all the criterion variables. The critical reviews are 94 and allied reviews are 16 in total.

The Review of literature helped the researcher from the methodological point of view too. It was learnt that most of the research studies cited in this chapter on Analysis and experiment design as the appropriate methods for finding out the foundation and main ingredient for future research and investigate in training methods to guide and complete the study.

CHAPTER - III

METHODOLOGY

This chapter summarizes how the research had been carried out. The role of the methodology was to carry on the research work in a scientific and valid manner. The purpose of the study was to find out the effect of yogic practices with and without Moderate physical activities on selected physiological, bio-chemical and psychological variables among middle aged obese men. In this chapter selection of subjects, selection of variables, experimental design, pilot study, criterion measures, reliability of instrument, training program, training schedule, collection of data and statistical technique have explained.

3.1 SELECTION OF SUBJECTS

Random group experimental design was used for the study. Simple random sampling design was followed to select the subjects. 125 middle aged men came forward and 90 middle aged men were screened and found middle aged obese symptoms by applying medical examination and 45 middle aged obese men were selected at random finally for the study aged between 40 – 50 years from Chennai.

The subjects were divided into three groups, each 15 namely experimental groups I, II and control group III. The control group has not given any training. The experimental groups I and II only underwent Yogic Practices with and without Moderate physical activities training respectively. The experimental groups practiced Yoga and moderate activities weekly six days for a period of twelve weeks. Group I underwent yogic practices with Moderate physical activities (n = 15) and Group-II underwent yogic practices without Moderate physical activities (n = 15) and Group III acted as the control group (n = 15) (routine work).

The requirement of the experiment procedures, testing as well as training schedule was explained to the subjects so as to get full co-operation of the effort required on their part and prior to the administration of the study. All the 45 subjects were given written information about the study and the investigator got individual

consent from each subject. Ethical guidelines of the Indian Council of Medical Research, New Delhi were followed by getting consent of the subjects.

3.2 SELECTION OF VARIABLES

The research scholar reviewed various scientific literatures pertaining to the yogic practices and moderate physical activities on selected physiological, biochemical, and psychological variables from books, journals, periodicals, magazines and research papers. Taking into consideration of feasibility criteria, availability of instruments and the relevance of the variables of the present study, the following variables were selected.

3.2.1 INDEPENDENT VARIABLES

Group I - Yogic practices with Moderate physical activities

Group II - Yogic practices without Moderate physical activities

Group III - Control Group (routine work)

3.2.2 DEPENDENT VARIABLES

Physiological Variables:

- Systolic blood pressure
- Diastolic blood pressure
- BMI (Body Mass Index)

Bio-chemical variables:

- Low density lipoprotein (LDL)
- High density lipoprotein (HDL)
- Total Cholesterol

Psychological Variables:

- Anxiety

- Self Confidence

- Job satisfaction

3.3 EXPERIMENTAL DESIGN

The study was formulated as a true random group design, consisting of a pre-test and post-test. The method of yogic practices with and without Moderate physical activities given to experimental group I & II and control group III is not given any kind of treatment. Initially pretest was conducted. After the experimental period of twelve weeks, post test scores were obtained from all the three groups. The differences between initial and final scores on Physiological, Bio-chemical and Psychological variables considered as the effect of yogic practices with and without Moderate physical activities on subjects. The mean differences were tested for significance using Analysis of Co-variance (ANCOVA).

The multiple mean comparisons used to prove the significant differences between the adjusted means of experimental group I & II with control group III. The significant differences were tested by Scheffe's post-hoc test.

3.4 PILOT STUDY

Pilot study is the miniature version of the research work. The pilot study was conducted before analyzing of training program with the help of experts in yogic practices and moderate physical activity to ensure the intensity, volume and response of the subjects. The aim of the pilot study was to know the subjects capability and to know the difficulty of conducting training program and to set a clear understanding about the duration of time, which is required for conducting the test.

Based on the response of the subjects in the pilot study, the training schedule was constructed however the individual differences were also considered while constructing the training program.

The pilot study was conducted with five middle aged obese men and their difficulties were noted and rectified. The calculated intra-class correlation of the pilot there was significant improvement in physiological variables Systolic blood pressure, Diastolic blood pressure and Body Mass Index. Bio-chemical variables are Low density lipoprotein, High density lipoprotein and Total Cholesterol. Psychological Variables are Anxiety, Self Confidence and Job satisfaction. Item analysis was followed to find out the reliability and validity of the psychological Questionnaires (Anxiety, Self Confidence and Job satisfaction).

3.5 CRITERION MEASURES

The present study was undertaken primarily to assess the effects of yogic practices with and without Moderate physical activities on selected physiological, bio-chemical and psychological variables among middle aged obese men. By ascertaining the literature and consulting with professionals and experts, the following variables were selected as the criterion measures in this study.

TABLE IV

S. No	Variables	Methods by	Make	Unit of Measurements
a.	**Physiological variables**			
1.	Systolic blood pressure	Citizens make digital portable blood pressure monitor	Dr.Morepen BP-09 (automatic blood pressure monitor)	mmHg
2.	Diastolic blood pressure	Citizens make digital portable blood pressure monitor	Dr.Morepen BP-09 (automatic blood pressure monitor)	mmHg
3.	Body mass index	Weighing machine &Stadiometer	Omron(HBF -375 body composition monitor)	Kg/m²
b.	**Bio-chemical variables**			
1.	LDL	Lab test	Guine Bio system	mg/dl
2.	HDL	Lab test	Guine Bio system	mg/dl
3.	Total Cholesterol	Lab test	Guine Bio system	mg/dl
c.	**Psychological variables**			
1.	Anxiety	Anxiety Questionnaire	Taylor's (1952) consisting of 50 questions.	Scores
2.	Self Confidence	Self-confidence Questionnaire	Rekha Agnihotri (1987) consisting of 52 questions.	Scores
3.	Job satisfaction	Job satisfaction Questionnaire	Bubey B.L, Uppal K.K, and Verma S.K. (1989) consisting of 25 questions.	Scores

3.6 RELIABILITY OF DATA

The reliability of data was assessed by using standing instruments and by establishing tester competency reliability of the test. One month before the commencement of the investigation, a pilot study was conducted and the reliability of the data was established by randomly selected five middle aged obese men as

subjects. To ensure reliability, test and re-test method was executed and the consistency of scores/values was statistically tested.

The tests were done twice, on the same subjects. The intra-class co-efficient of correlation was used to find out the reliability of the data and the results have been given in Table V, since the 'R' values were much higher than the required value, the data were accepted as reliable in terms of the instrument, test and subjects. The intra-class correlation coefficient obtained for test-retest data are presented in Table V.

TABLE V INTRA-CLASS CORRELATION COEFFICIENT OF TEST-RETEST SCORES

S.No	Variables	Coefficient of Correlation
I	**Physiological Variables**	
1	Systolic blood pressure	0.91*
2	Diastolic blood pressure	0.92*
3	Body Mass Index	0.90*
II	**Bio-chemical variables**	
1	Low density lipoprotein	0.88*
2	High density lipoprotein	0.89*
3	Total Cholesterol	0.88*
III	**Psychological Variables**	
1	Anxiety	0.91*
2	Self Confidence	0.92*
3	Job satisfaction	0.90*

* Significant at 0.05 level of confidence

The reliability of data was assessed by establishing the tester's competency, instrument reliability and subject reliability. All the instruments such as Sphygmomanometer, stethoscope, Blood Pressure Monitor, Weighing Machine, Stature meter, laboratory equipment and questionnaires used were standard and therefore their calibration were accepted and accurate enough for the purpose of the study.

3.7 RELIABILITY OF INSTRUMENTS

The instruments which were required to test the selected criterion variables were, Sphygmomanometer was bought from Dr. Morepen BP-09 (automatic blood pressure monitor). BMI Machine was purchased from Omron (HBF -375 body composition monitor), Chennai, Weighing Machine and Stature Meter were purchased from Chennai, and all the imported instruments used in this study were in excellent condition and were purchased from reputed and reliable scientific companies. The same brands are used in many reputed hospitals and medical labs. Their calibrations were tested and accepted to be accurate enough to serve the purpose of the study. Well qualified technicians and assistants were made use of to measure the selected physiological and bio-chemical variables.

Anxiety questionnaire developed by Taylor's used to measure Anxiety, Self-confidence questionnaire developed by Rekha Agnihotri self-confidence and Job satisfaction questionnaire developed by Bubey B.L, Uppal K.K, and Verma S.K. were obtained from the Department of Yoga of the Tamil Nadu Physical Education and Sports University, Chennai, Tamil Nadu. The testing procedure was started only after establishing reliability of the instruments. The following questionnaire, scale, tests and instruments were used for recording the Physiological, Bio-chemical and Psychological variables such as Systolic blood pressure, Diastolic blood pressure Body Mass Index, Low density lipoprotein (LDL), High density lipoprotein (HDL), Total Cholesterol, Anxiety, Self Confidence and Job satisfaction were found reliable. The reliability and validity of the Adjustment and self-confident questionnaires were established by adopting the method of item analysis through pilot study.

3.8 TESTER'S RELIABILITY

Reliability was established by the test-retest processes. Subjects from all the groups were tested on selected variables. The repeated measurement of individuals on the same test is done to determine reliability. It makes sense then to use a unit-variable statistics ANCOVA.

3.9 SUBJECTS' RELIABILITY

The analysis of co-variance value of the above test and retest also indicated subjects reliability as the same subjects where use to under similar condition by same tester. The analysis of co-variance of reliability was significance condition by same test. The analysis of co-variance of reliability was significance at 0.05 levels.

3.10 ORIENTATION TO THE SUBJECTS

For the collection of data, the investigator explained the purpose of training programme to the subjects and their part in the study. The investigator explained the procedures of test on selected criterion variables and gave instructions about the points and procedures to be followed by the subjects for measuring. Three sessions were spent to familiarize the subjects with the techniques used to execute the yogic practices and moderate physical activities. It was useful to them while performing the yogic practices and moderate physical activities correctly. The subjects were verbally motivated to attend the training session regularly. Further control group was specially instructed to avoid any special training programme till the end of the experimental period. The subjects of all the groups were motivated adequately to perform their maximum during the training and testing periods.

3.11 TRAINING PROCEDURE ON YOGIC PRACTICES

The subjects were selected at random and were divided into three groups. For the experimental group I, yogic practices with moderate physical activities were given for 12 weeks, 6 days a week. The duration of the daily practices for first four weeks was 40 minutes, for the second four weeks 50 minutes, and last four weeks for 60 minutes a week excepting Sundays. The control group was kept on active rest.

Yoga training programmes for selected groups are presented in the Tables VI, VIII, X, XII, XIII & XIV.

3.11.1 STARTING PRAYER

सह नौ भुनक्तु ।

सह वीर्यं करवावहै ।

तेजस्वि नावधीतमस्तु मा विद्विषावहै ।

ॐ शान्तिः शान्तिः शान्तिः ॥

Om Saha Naav(au)-Avatu   !

Saha Nau Bhunakta !

Saha Viryam Karavaahai!

Tejasvi Naav(au)-Adhitam-Astu Maa Vidvissaavahai !

Om Shaanthi Shaanthi Shaanthi !!

3.11.1.1 MEANING OF STARTING PRAYER

1. Om, May God Protect us Both (the Teacher and the Student) (during the journey of awakening our Knowledge),

2. May God Nourish us Both (with that spring of Knowledge which nourishes life when awakened),

3. May we Work Together with Energy and Vigor (cleansing ourselves with that flow of energy for the Knowledge to manifest),

4. May our Study be Enlightening (taking us towards the true Essence underlying everything), and not giving rise to Hostility(by constricting the understanding of the Essence in a particular manifestation only),

5. Om, Peace, Peace, Peace (be there in the three levels - Adhidaivika, Adhibhautika and Adhyatmika).

3.11.2 LOOSENING EXERCISES

3.11.2.1 PAWANMUKTASANA SERIES-1 (ANTI-RHEUMATIC GROUP)

PRACTICE 1 PRARAMBHIK STHITI (BASE POSITION)
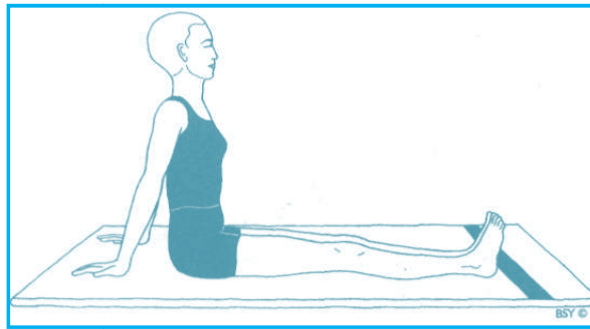
FIGURE 3

- Sit with the legs outstretched.
- Place the palms of the hands on the floor to the sides and just behind the buttocks.
- The back, neck and head should be straight.
- Straighten the elbows.
- Lean back slightly, takes the support of the arms.
- Close the eyes and relax the whole body in this position.

PRACTICE 2: PADANGULI NAMAN (TOE BENDING)
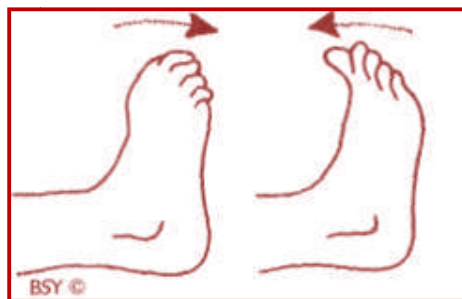
FIGURE 4

- Sit in the base position with the legs outstretched and the feet slightly apart. Place the hands beside and slightly behind the buttocks.

- Lean back a little, using the arms to support the back.

- Keep the spine as straight as possible.

- Be aware of the toes. Move the toes of both feet slowly backward and forward, keeping the feet upright and the ankles relaxed and motionless.

- Hold each position for a few seconds.

- Repeat 10 times.

Breathing:

- Inhale as the toes move backward.

- Exhale as the toes move forward.

Awareness:

- On the breath, mental counting and the stretching sensation produced by the movement.

PRACTICE 3: GOOLF NAMAN (ANKLE BENDING)
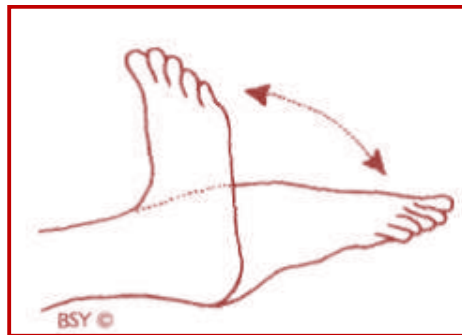
FIGURE 5

- Remain in the base position. Keep the feet slightly apart. Slowly move both feet backward and forward, bending them from the ankle joints. Try to stretch the feet forward to touch the floor and then draw them back towards the knees. Hold each position for a few seconds.

- Repeat 10 times.

Breathing:

- Inhale as the feet move backward.

- Exhale as the feet move forward.

Awareness:

- On the breath, mental counting and the stretch in the foot, ankle, calf and leg muscles or joints.

PRACTICE 4: GOOLF CHAKRA (ANKLE ROTATION)
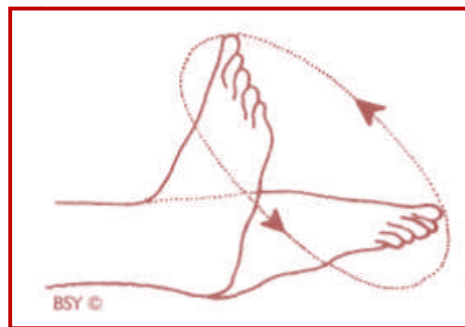
FIGURE 6

- Remain in the base position.

- Separate the legs a little, keeping them straight.

- Keep the heels on the ground throughout the practice.

Stage 1:

- Slowly rotate the right foot clockwise from the ankle 10 times and then repeat 10 times anti-clockwise.
- Repeat the same procedure with the left foot.

Stage 2:

- Place the feet together.
- Slowly rotate both feet together in the same direction, keeping them in contact with each other.
- Do not allow the knees to move.
- Practice 10 times clockwise and then 10 times anticlockwise.

Stage 3:

- Keep the feet separated.
- Slowly rotate both feet from the ankles together but in opposite directions.
- The big toes should touch each other on the inward stroke of each foot.
- Do 10 rotations in one direction and then 10 rotations in the opposite direction.

Breathing:

- Inhale on the upward movement.
- Exhale on the downward movement.

Awareness:

- On the breath, mental counting and rotation.

PRACTICE 5: GOOLF GHOORNAN (ANKLE CRANK)
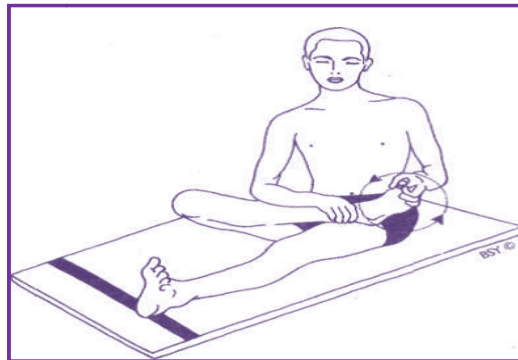
FIGURE 7

- Remain in the base position.

- Bend the right knee and bring the foot towards the buttock.

- Turn the knee out to the side and place the foot on the left thigh.

- Make sure the ankle is far enough over the thigh to be free for rotation.

- Hold the right ankle with the right hand to support the ankle.

- Hold the toes of the right foot with the left hand.

- With the aid of the left hand, slowly rotate the right foot 10 times clockwise, then 10 times anti-clockwise.

- Repeat with the left foot placed on the right thigh.

Breathing:

- Inhale on the upward movement.

- Exhale on the downward movement.

Awareness:

- On the breath, mental counting and rotation.

Benefits:

- All the foot and calf asanas help in returning the stagnant lymph and venous blood. They thus relieve tiredness and cramp, and prevent venous thrombosis especially in bedridden, post-operative patients.

PRACTICE 6: JANU NAMAN (KNEE BENDING)
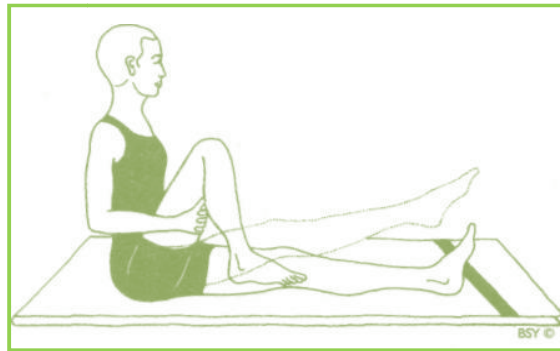
FIGURE 8

- Stay in the base position. Bend the right knee and clasp the hands under the right thigh.

- Straighten the right leg, pulling up the kneecap.

- Keep the hands under the thigh but straighten the arms.

- Do not allow the heel or toes to touch the floor.

- Bend the right leg at the knee so that the thigh comes close to the chest and the heel near the buttocks.

- Keep the head and spine straight.

- This is one round.

- Practice 10 rounds with the right leg and then 10 rounds with the left leg.

Breathing:

- Inhale while straightening the leg.

- Exhale while bending the leg.

Awareness:

- On the breath, mental counting, stretch in the thigh muscles and synchronized movement.

PRACTICE 7: JANU CHAKRA (KNEE CRANK)
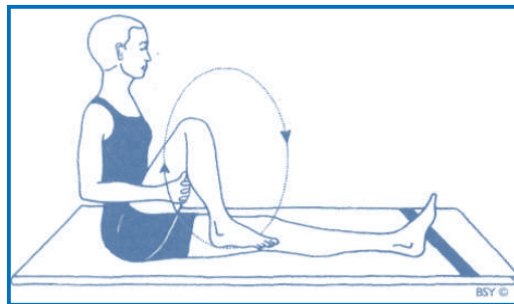
FIGURE 9

- Sit in the base position.

- Bend the right leg at the knee as described in practice 6.

- Place the hands under the right thigh and interlock the fingers or cross the arms holding the elbows.

- Raise the right foot from the ground.

- Rotate the lower leg from the knee in a large circular movement; try to straighten the leg at the top of the upward movement.

- The upper leg and trunk should be completely still.

- Rotate 10 times clockwise and then 10 times anti-clockwise.

- Repeat with the left leg.

Breathing:

- Inhale on the upward movement.

- Exhale on the downward movement.

Awareness:

- On the breath, mental counting, movement and perfection of circular rotation.

Benefits:

- Since the knee joint bears the whole weight of the body and has no strong muscles for support, it is most vulnerable to injuries, sprains and osteoarthritis. All the knee asanas strengthen the quadriceps muscle and the ligaments around the knee joint. These asanas rejuvenate the joint by activating the healing energies.

PRACTICE 8: ARDHA TITALI ASANA (HALF BUTTERFLY)
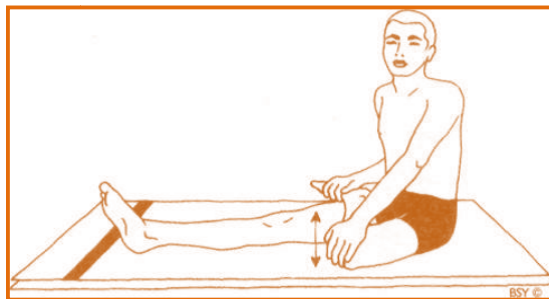
FIGURE 10

- Sit in the base position.

- Bend the right leg and place the right foot as far up on the left thigh as possible.

- Place the right hand on top of the bent right knee.

- Hold the toes of the right foot with the left hand.

- This is the starting position.

Stage 1: with breath synchronization

- While breathing in, gently move the right knee up towards the chest. Breathing out, gently push the knee down and try to touch the knee to the floor.

- The trunk should not move.

- Do not force this movement in any way.

- The leg muscles should be passive, the movement being achieved by the exertion of the right arm.

- Slowly practice 10 up and down movements.

Awareness:

- On the breath, mental counting, movement of hip joint and relaxation of inner thigh muscles.

Stage 2: without breath synchronization

- Remain in the same position with the right leg on the left thigh.

- Relax the right leg muscles as much as possible.

- Push the right knee down with the right hand and try to touch the knee to the floor.

- Do not strain.

- Let the knee spring up by it.

- The movement is achieved by use of the right arm only.

- Practice 30 up and down movements in quick succession.

- Breathing should be normal and unrelated to the practice.

- Repeat stages 1 and 2 and the unlocking procedure (see note below) with the left leg.

Awareness:

- On mental counting, movement of hip joint and relaxation of inner thigh muscles.

Benefits:

- This is an excellent preparatory practice for loosening up the knee and hip joints for meditative poses.
- Those people who cannot sit comfortably in cross-legged positions should practice ardha titali asana daily, both morning and evening.

Practice note:

- To unlock the leg after completing stage 2, slowly and carefully straighten the leg.
- Bend it once, bringing the heel near the buttock.
- Straighten the leg.
- This procedure will ensure that the knee joint is realigned correctly.

PRACTICE 9: SHRONI CHAKRA (HIP ROTATION)
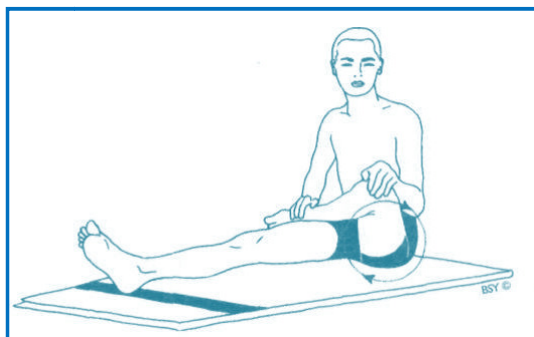
FIGURE 11

- Sit in the same starting position as for asana 9 with the right leg on the left thigh.

- Using the muscles of the right arm, rotate the right knee in a circle trying to make the circular movement as large as possible.

- The index finger may be pointed out and used as a guide to perfection of the circular movement.

- Practice 10 rotations clockwise and then 10 rotations anticlockwise.

- Straighten the leg slowly.

- Release the knee as described in the note to asana 9.

- Repeat with the left leg.

Breathing:

- Inhale on the upward movement.

- Exhale on the downward movement.

Awareness:

- On the breathing, mental counting and rotation of the hip joint.

Benefits:

- This is an excellent preparatory practice for loosening up the hip joints for meditative poses.

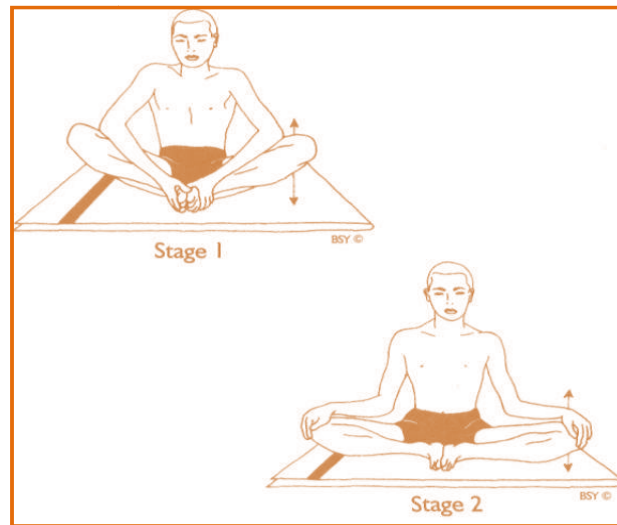**PRACTICE 10: POORNA TITALI ASANA (FULL BUTTERFLY)**

FIGURE 12

- Sit in the base position.

- Bend the knees and bring the soles of the feet together, keeping the heels as close to the body as possible.

- Fully relax the inner thigh muscles.

Stage 1:

- Clasp the feet with both hands.

- Gently bounce the knees up and down, using the elbows as levers to press the legs down.

- Try to touch the knees to the ground on the downward stroke.

- Do not use any force.

- Practice 30 to 50 up and down movements.

Stage 2:

- Keep the soles of the feet together.

- Place the hands on the knees.

- Using the palms, gently push the knees down towards the floor, allowing them to spring up again.

- Do not force this movement.

- Repeat 20 to 30 times.

- Straighten the legs and relax.

Breathing:

- Normal breathing, unrelated to the practice.

Awareness:

- On mental counting, movement and relaxation.

Benefits:

- Both stages prepare the legs for mastery of padmasana and other meditative asanas. The inner thigh muscles hold a lot of tension which is relieved by these asanas.

- They also remove tiredness from long hours of standing and walking.

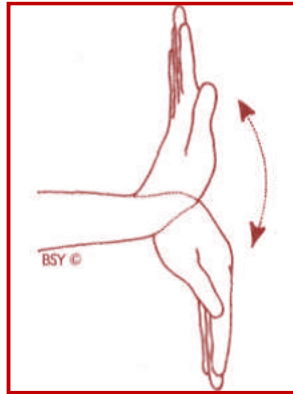**PRACTICE 11: MANIBANDHA NAMAN (WRIST BENDING)**

FIGURE 13

- Remain in the base position or a cross-legged pose.

- Stretch the arms in front of the body at shoulder level.

- Keep the palms open and fingers straight throughout the entire practice.

- Bend the hands backward from the wrists as if pressing the palms against a wall with the fingers pointing toward the ceiling.

- Bend the hands forward from the wrists so that the fingers point toward the floor.

- Keep the elbows straight throughout the practice.

- Do not bend the knuckle joints or fingers.

- Bend the hands up again for the next round.

- Repeat 10 times.

Breathing:

- Inhale with the backward movement.

- Exhale with the forward movement.

Awareness:

- On the breath, mental counting, movement in the wrist joint and stretching of the forearm muscles.

Benefits:

- The hand and wrist asanas are beneficial for the joints related problems.

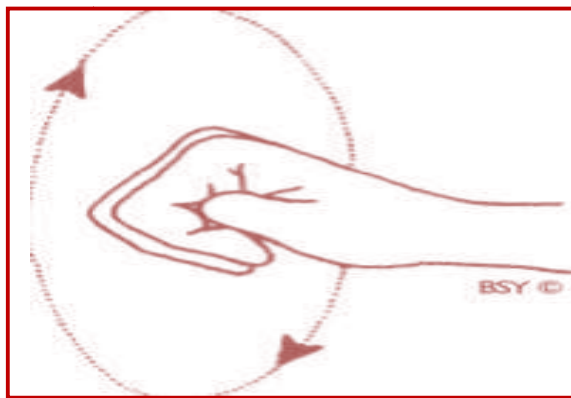**PRACTICE 12: MANIBANDHA CHAKRA (WRIST JOINT ROTATION)**

FIGURE 14

- Remain in the base position or a comfortable cross-legged pose, but keep the back straight.

Stage 1:

- Extend the right arm forward at shoulder level.

- Make a fist with the right hand, with the thumb inside.

- The left hand may be used as a support if necessary.

- This is the starting position.

- Slowly rotate the fist about the wrist, ensuring that the palm faces downward throughout the rotation.

- The arms and elbows should remain perfectly straight and still. Make as large a circle as possible.

- Practice 10 times clockwise and 10 times anti-clockwise.

- Repeat the same with the left fist.

Stage 2:

- Extend both arms in front of the body with the fists clenched.

- Keep the arms straight and at shoulder level.

- Rotate the fists together in the same direction.

- Practice 10 times in each direction.

Stage 3:

- Practice as in stage 2.

- Rotate the fists together in the opposite direction.

- Practice 10 times in each direction.

Benefits:

- The hand and wrist asanas are beneficial for arthritis of the related joints. They also relieve tension caused by prolonged writing, typing and so on.

PRACTICE 13: KEHUNI NAMAN (ELBOW BENDING)
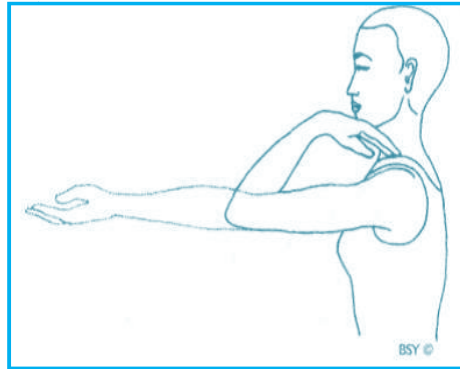
FIGURE 15

Stage 1:

- Remain in the base position or a cross-legged pose.

- Stretch the arms in front of the body at shoulder level.

- The hands should be open with the palms facing up.

- Bend the arms at the elbows and touch the fingers to the shoulders.

- Straighten the arms again.

- This is one round.

- Repeat 10 times.

Stage 2:

- Extend the arms sideways at shoulder level, hands open and palms facing the ceiling.

- Bend the arms at the elbows and touch the fingers to the shoulders.

- Again straighten the arms sideways.

- Repeat 10 times.

Breathing:

- Inhale while straightening the arms.

- Exhale while bending the arms.

Awareness:

- On the breathing, the mental counting and the movement.

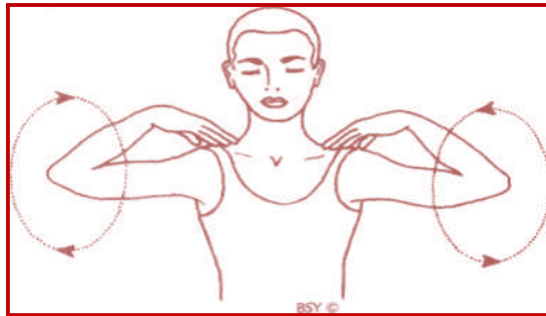## PRACTICE 14: SKANDHA CHAKRA (SHOULDER SOCKET ROTATION)

FIGURE 16

Stage 1:

- Remain in the base position or a cross-legged pose.

- Place the fingers of the right hand on the right shoulder.

- Keep the left hand on the left knee and the back straight.

- Rotate the right elbow in a large circle.

- Practice 10 times clockwise and 10 times anti-clockwise.

- Repeat with the left elbow.

- Make sure that the head, trunk and spine remain straight and still.