CHAPTER 2

LITERATURE REVIEW

Review of literature is an essential component of research study as it provides a broad understanding of the research problem. The investigator has made a thorough study on the available research sources, which has helped in projecting the widened perspective of the study.

This chapter consists of 3 Parts

2.1 PART – I : Theoretical Literature related to Hypertension

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PART I

2.1 THEORETICAL LITERATURE RELATED TO HYPERTENSION

**Definition:** Hypertension, or high blood pressure, is a persistent blood pressure above 90 mm Hg between the heart beats (diastolic) or over 140 mm Hg at the beats (systolic)

**Causes**

- Above 40 Years
- Obesity
- Intake of contraception
- A high fat consume.
- Stress at work and in the daily life.
- Smoking.
- Over-weight.
- Lack of exercise.

**High Risk Factors**

- A diet high in saturated fat
- Excessive salt consumption
- Overweight and obesity
- A sedentary lifestyle and lack of exercise
- Excessive alcohol consumption
- Smoking
- Un-managed stress
- A family history of high blood pressure
- Being over 65 years of age
- Co-morbidities such as diabetes

**Signs & Symptoms:** It is asymptomatic but a person with hypertensive crisis (very high blood pressure) may experience

- Frequent Headache
- Anxiety
- Fatigue
- Dizziness
- Palpitations
- Tachycardia (rapid heart rate)
- Nosebleeds
- Blurred vision
- shortness of breath

**Risk Factors**

**Modifiable Risk Factors**

- Family history
- Age
- Sex
Non Modifiable Risk Factors

- Obesity
- Diet
- Physical activity
- Smoking
- Alcoholism

Complications

- Heart attacks
- Stroke
- Heart failure
- Aortic dissection (splitting of aorta)
- Kidney damage
- Vision loss
- Erectile dysfunction (a type of impotence)
- Memory loss
- Fluids in the lungs
- Diseases of the peripheral arteries

How to manage high blood pressure

- Eating a healthy diet
- Reducing salt intake
- Exercising regularly
- Stopping smoking
- Reducing alcohol consumption
• Managing stress
• Having regular blood pressure checks
• Reducing salt consume.
• Reduction of fat consume, and especially of saturated fat consume.
• Weight reduction.
• Relaxing and stress reduction techniques, for example meditation and autogenic training.
• Regular exercise.

2.2 PART – II: EMPIRICAL LITERATURE

2.2.1 Hypertension

Empirical literature on Hypertension is presented here under the following headings as

2.2.1.1 Magnitude of the problem

WHO (2013) stated that in Worldwide, high blood pressure is estimated to affect more than one in three adults aged 25 and over, or about one billion people. The theme of the World Health Day 2013 is “Measure your Blood pressure, reduce your risk” for calling for intensified efforts to prevent and control Hypertension[75].

WHO (2012) estimated that One in three adults worldwide are affected with raised blood pressure – a condition that causes around half of all deaths from stroke and heart disease. This report is further evidence of the dramatic increase in the conditions that trigger heart disease and other chronic illnesses, particularly in low- and middle-income countries [76].

Pal et al., conducted a study to assess the nature of sympathovagal imbalance (SVI) in prehypertensives by short-term analysis of heart rate variability (HRV) to understand the alteration in autonomic modulation and the contribution of
BMI to SVI in the genesis of prehypertension. Body mass index (BMI), basal heart rate (BHR), blood pressure (BP), rate pressure product (RPP) and HRV indices are measured. The results in three groups of subjects revealed that normotensives having normal BMI (Group 1), prehypertensives having normal BMI (Group 2) and prehypertensives having higher BMI (Group 3). SVI was assessed from LF-HF ratio and correlated with BMI, BHR, BP and RPP in all the groups by Pearson correlation. It was advised that life-style modifications such as yoga and exercise would enable achieve the sympathovagal balance and blood pressure homeostasis in prehypertensives [77].

**WHO (2011)** studied the prevalence of Hypertension in India. The prevalence of Hypertension was found among 33.2% males and 31.7% females and totally 32.5%. It also states that 9.9% males and 12.2% females and totally 11% are in overweight category. Moreover, regarding Raised cholesterol 25.8% males, 28.3% females and 27.1% total population [46].

**Dutta A and Ray MR** studied the prevalence of hypertension, prehypertension and tachycardia among the women in rural areas of West Bengal, identify co-factors associated with the prevalence and contribute to the body of evidence for future health programs to identify at-risk groups. A population-based cross-sectional study was conducted among 1186 remote women participants, aged 18 years or more. They were interviewed using standard structured questionnaire. For each participant, two blood pressure measurements with an interval of 48 hours. Overall prevalence of hypertension in the study subjects was 24.7% and that of pre-hypertension and tachycardia was 40.8% and 6.4%, respectively. Both hypertension and pre-hypertension were seen to increase with age. Other identified significant factors were use of biomass fuel for cooking, absence of separate kitchen, higher body mass index (BMI), education and average family income [78].

**Biswa M and Manna CK** conducted a cross-sectional, community-based survey to investigate the prevalence of hypertension among the members of the households of the Scheduled Caste community of three selected villages in District Nadia, West Bengal, India, in individuals aged 20-70 years. Prevalence of
prehypertension, hypertension, ISH and IDH in the study population was 19.28%, 17.93%, 8.07% and 6.72%, respectively. There was a significant development of hypertension with increasing age (p<0.001). Males (19.26%) showed a higher hypertensive rate than females (16.66%); however, this was not significant. In the three increasing body mass index (BMI) groups (<19.9, 20-24.9 and ≥25 kg/m²), the percentages of patients with hypertension were 19.27%, 23.23% and 29.62%, respectively. Hypertension was higher in the waist hip ratio (WHR) group of 0.90-0.99 (hypertension = 23.12%) than the WHR group of 0.80-0.89 (hypertension=7.89%). BMI and WHR were significantly higher (p<0.001) in the hypertensive group compared with the non-hypertensive group [79].

Tsugane S et al., quoted the attributable factors and hazard ratios associated with BP in relation to stroke and CHD. A total of 943 stroke events, 182 CHD events, 262 stroke deaths and 120 CHD deaths occurred between the baseline questionnaire. BP levels were linearly associated with incidence and mortality of CVD in men and women. The contribution of normal BP, high normal BP and mild Hypertension to the occurrence of stroke events were greater than those made by moderate and severe Hypertension, highlighting the importance of primary prevention and treatment of low- to moderate degrees of Hypertension [80].

WHO studied the prevalence of Hypertension in India, in the study group aged 20 -60 yrs. The prevalence of Hypertension was 59.5 and 69.9 per 1000 in males and females respectively in the urban population and 35.5 and 35.9 per 1000 in males and females respectively in the rural population [81].

Sampatti ST et al., conducted a community-based cross-sectional study to find out prevalence of hypertension in rural areas of Maharashtra. The subjects were 1297 persons aged 19 years and above. A house-to-house survey was conducted and interviewed the participants by systematic random sampling method, using pretested structured standard questionnaire. Two independent blood pressure (BP) readings were taken in sitting position by visiting each participant at their home. Overall prevalence of hypertension in the study subjects was 7.24%. Multiple logistic regression analysis identified various factors significantly associated with
hypertension were age, sex, BMI, additional salt intake, smoking, DM, alcohol consumption, and higher socioeconomic status. The overall prevalence of hypertension in study subjects was 7.24% [82].

Agrawal VK et al., conducted a cross-sectional study on prevalence of hypertension and its determinants in rural population among 406 people (218 men and 188 women) of 30 years and above. It was found that prevalence of systolic hypertension in rural community was 18.5% and of diastolic hypertension 15% with higher prevalence in the age group of 60 years and above, in case of men and women [83].

Perez LH et al., conducted a study to determine the relation between overweight, diabetes, stress and hypertension among 228 cases randomly selected in a rural adult population in Yarumal-Antioquia, Colombia. Obese people (body mass index (BMI) $\geq 30$ kg/m$^2$) showed an increased or of hypertension compared to those with a BMI $< 25$ kg/m$^2$, OR: 3.83 [95% confidence interval (CI): 1.83-8.00]. A high level of psychological stress was associated with hypertension (measured on a tension-anxiety scale), OR: 5.02 (95% CI: 2.25-11.19). This study provides evidence that BMI, stress (feelings of anxiety or tension), and diabetes are independently associated with an increased risk of hypertension in a rural area of Colombia [84].

2.2.1.2 Diagnosis of hypertension

Hasumi, Takahiro et al., carried out a study to evaluate the age-specific, sex-specific, and race-specific prevalence of hypertension among 59, 227 adults (ages 18 and older) South African adults. The weighted prevalence of self-reported diagnosis of hypertension by a health professional was 10.4%. The prevalence of hypertension increased significantly with age for both men and women. In total, 94% of those reporting a diagnosis of hypertension reported taking antihypertensive medications. The study concluded that there is a significant burden from hypertension in South Africa, especially as the under-diagnosis of hypertension [85].
Alonso A et al. explained the association between alcohol consumption, including the preferential order of alcoholic beverage and the frequency of consumption per week, and the risk of Hypertension in a Mediterranean cohort. Self-reported data on Hypertension diagnoses were collected, 554 incident cases of Hypertension were identified over a total of 43,562 per year. The consumption of beer was associated with risk of Hypertension. However the weekly pattern of alcohol consumption did not have a significant impact on the risk of Hypertension [86].

National Health and Nutrition Survey division (2008) examined whether Hypertension is associated with CVD mortality risk and whether the association of BP with CVD outcome is by social demographics or Hypertension treatment and control. Data collected from the Third National Health and Nutrition Examination Survey through 2000 were used to estimate the relative risk of death from CVD Hypertension. The study suggested a strong, significant association of elevated BP with CVD mortality risk, particularly among persons aged < 65 years. Treatment and control of Hypertension eliminated the excess CVD mortality risk observed among the hypertension population [87].

Jacks H et al., explained the prevalence of anxiety symptoms, anxiety disorder or specified anxiety disorders in adults aged > 60 in either Community or clinical settings was done. Study concluded that anxiety disorder, particularly Generalised Anxiety Disorder was common and issue related to Co morbidity and the nature of anxiety in old age remained unresolved. This hampered the design of Intervention Programmes and highlighted the need for further research with a primary focus on anxiety [88].

Okayama A, et al., examined the association within high normal BP and CVD. 5494 Japanese individuals (aged 30 – 79 yrs without at baseline) were included for the study. The frequencies of high-normal BP and Hypertension Stage I and Stage II were 18.0%, 20.1% and 10.1% for men and 15.9%, 15.6% and 8.8% for women respectively. The risk of Myocardial Infarction and Stroke for each BP category were similar to those of CVD. The study concluded that, high – normal BP
is a risk factor for the incidence of stroke and Myocardial Infarction in a general urban population of Japanese men [89].

Soudarssanane MB et al. conducted a cohort study to measure the incidence of HT and study the relationship of BP with age, sex, socioeconomic status, BMI, physical exercise, salt intake, smoking and alcohol consumption. It consists of 756 subjects (19-24 years) in urban field area of Department of Preventive and Social Medicine, JIPMER, was followed by house visits for measurement of sociodemographic variables, anthropometry, salt intake, physical activity and BP. A total of 555 subjects from the 2002 cohort were contacted (73.4%), in that 54.5% subjects who were below 5th percentile, 93.6% subjects between 5th and 95th percentiles and 72% of those above 95th percentile previously persisted in the same cut-offs for systolic blood pressure (SBP). The corresponding figures for diastolic blood pressure (DBP) were 46.2, 92.2 and 74.1%, respectively. Annual incidence of HT was 9.8/1000. Early diagnosis of hypertension even among adolescents/young adults is an important preventive measure, as tracking exists in the population [90].

Feldstein CA et al. conducted a Cross-sectional survey to assess the relationship between 24-h ambulatory blood pressure monitoring (ABPM) and three commonest anthropometric measurements for obesity [body mass index (BMI), waist circumference (WC) and waist-hip ratio (WHR)] in patients with essential hypertension never treated or after a 3 week placebo period, living in Buenos Aires. Three-hundred seventy-seven essential hypertensives, aged 18-86 years, of either sex, were consecutively recruited. The prevalence of overweight-obesity was 56.76% in women and 75.86% in men. High WHR prevalence in non-obese women was 4.5% and 4.1% in non-obese men while high values of WC were observed in 3.0% of non-obese women and in 0% of non-obese men. These results indicated a high prevalence of overweight-obesity (more than 56% of women and 75% of men) in our hospital-based sample of essential hypertension and that the WHR offers additional information beyond BMI and WC to predict the hypertension risk according to the ABPM [91].
Tull S et al., assessed the relationship of abdominal obesity and BP. The study examined the elevated BP in a population of black Caribbean women aged 20-55 yrs. 133 randomly selected women from the island of Barbados comprised the study sample. Data collected included Anthropometric and BP measurements and information about internalized racism, anxiety and depression. The study concluded that the abdominal obesity should be taken into account as a risk factor (eg, Diabetes & CVD) [92].

Singh RB et al. studied the prevalence of central obesity and age-specific waist:hip ratio of urban women from five Indian cities. Cross-sectional surveys were conducted in 6-12 urban streets in different parts of India on randomly selected 3212 women, aged 25-64 years, from Moradabad (n = 902), Trivandrum (n = 760), Calcutta (n = 365), Nagpur (n = 405), and Bombay (n = 780). Evaluation was done with a questionnaire administered by a physician and a dietician, a physical examination, and anthropometric measurements. The results revealed that the overall prevalence of central obesity among the total number of women was 55.0%, with the highest prevalence in Calcutta (62.2%) and the lowest in Bombay (47.4%). Body mass index, sedentary lifestyle, and family history of excess intake of fat were significant risk factors for central obesity [93].

2.2.2 Complimentary/ Alternative Medicine (CAM)

2.2.2.1 Effect of Yoga on Blood pressure

Deepa T. et al. conducted a study to evaluate the Effect of yoga and meditation on 15 mild to moderate essential hypertensives treated with antihypertensive drugs along with yoganidra. The study showed a significant fall of mean blood pressure after 3 months of yoganidra (p <0.01) [94].

Naik A conducted a study to evaluate the effect of left nostril breathing on 30 hypertensive patients to evaluate the heart rate and blood pressure. The result showed that the mean pulse rate dropped from 84.73 ± 1.89 per minute to 81.80 ± 1.84 per minute. Systolic blood pressure dropped from 144.50 ± 3.68 mmHg to
133.83 ± 3.66 mmHg. Diastolic blood pressure dropped from 100.96 ± 2.48 mmHg to 94.83 ± 2.41 mmHg [95].

**Chanda Rajak et al.** assessed whether regular practice of Yoga for six months can reduce the cardiovascular hyper-reactivity induced by cold pressor test. The study group comprised 75 healthy subjects of 25-45 years age group. Initially there were 27 hyperreactors to cold pressor test. The hyper-reactivity of 22 volunteers converted to hypo-reactivity after the yoga therapy of six months (81.48%). Other parameters like basal blood pressure, rise in blood pressure, pulse rate and rate of respiration were also statistically significantly reduced [96].

**Bhavanani, AB et al.**, assessed the immediate effect of Immediate effect of sukha pranayama on cardiovascular variables among 23 patients with hypertension and instructed to perform sukha pranayama for 5 minutes at the rate of 6 breaths/min. The results revealed a significant (p < .05) reduction in HR and a highly significant (p < .001) reduction in systolic pressure, pulse pressure, mean arterial pressure, rate-pressure product, and double product with an insignificant fall in diastolic pressure [97].

**Ananda Balayogi et al.**, undertaken a study to determine the immediate cardiovascular effects of sukha pranayama in 23 hypertensive patients attending the Yoga OPD at JIPMER. The subjects were instructed to perform sukha pranayama for 5 minutes at the rate of 6 breaths/min. Heart rate (HR) and BP were recorded before and immediately after the intervention. Post-intervention statistical analysis revealed a significant (p < .05) reduction in HR and a highly significant (p < .001) reduction in systolic pressure, pulse pressure, mean arterial pressure, rate-pressure product, and double product with an insignificant fall in diastolic pressure [98].

**Seema Maini et al.**, conducted a study to highlight haemodynamic effects of meditation by studying its impact on blood pressure, heart rate and ECG. The study was conducted on 100 healthy subjects (50 meditators and 50 non-meditators) from Brahma Kumari Ashram. Anthropometric measurements were taken. Systolic and diastolic blood pressures, heart rate and ECG was recorded. The results
revealed that mean heart rate, systolic blood pressure, diastolic blood pressure, heart rate were significantly lower in subjects who practised meditation regularly than in subjects who did not perform Rajyoga Meditation. The study concluded that Yoga and Meditation, given its positive effects on physiology of human body, if practised regularly, can emerge as one of the important non-pharmacological method of prevention of heart disease [99].

Nayak HK et al., studied the prevalence of different types of Self Relaxation Practices(SRPs) and their sociodemographic profile. A community-based cross-sectional study was carried out in Ahmedabad city, Gujarat, India on 904 participants selected by stratified sampling. Of these, 310 (34.3%) were doing SRPs and 594 (65.7%) were not doing any type of SRPs. Significant (P<0.05) differences were noticed between the two groups; in females, it was (SRP 58.4% vs non-SRP 49.8%) in the age group 40 to 59 years (44.2 vs 33.8%), those from sedentary occupation (93.9% vs 85.4%), the persons belonging to upper socioeconomic status (70.6% vs 61.8%), and living in central and western zones (66.5% vs 24.6%) and had less number of diabetes (SRP 10.8% vs non-SRP 19.7%) and hypertension (20.7% vs 34.2%). People doing SRPs were able to maintain balance between work and other activities than non-SRPs group (198/310, 63.9% vs 42/594, 7.1%). Among SRPs, majority (243, 78.4%) were involved in religious activities followed by yoga, 36(11.6%), and meditation, 15 (4.8%). The study concluded that Persons practicing SRPs were less likely to have diabetes and hypertension as compared with those who do not practice SRPs [100].

Pramanik et al. conducted a study to evaluate the immediate effect of slow pace bhastrika pranayama (respiratory rate 6/min) for 5 minutes on heart rate and Blood Pressure and the effect of the same breathing exercise for the same duration of time (5 mins) following oral intake of hyosine-N-butyl bromide. It was noted that after slow bhastrika pranayamic breathing for 5 mins, both the systolic and diastolic BP decreased significantly with a slight fall in heart rate. No significant alteration in both BP and Heart rate was observed in Volunteers who performed the same breathing exercise for the same duration following oral intake of hyosine-N-butyl bromide [101].
Raghuraj P et al. assessed the immediate effect of specific nostril yoga breathing practices on autonomic and respiratory variables. Autonomic and respiratory variables were studied in 21 male volunteers with ages between 18 and 45 years. Each session was for 40 min; out of which 30 min for the breathing practice. Assessments included heart rate variability, Skin Conductance, finger Plethysmogram amplitude, breath rate and BP. Results revealed that unilateral nostril yoga breathing practices appear to influence the BP in different ways [102].

Sarkar L et al. studied on Alternate Nostril Breathing (ANB), the Nadisudhi Pranayama on some cardio-respiratory functions which were investigated in healthy young adults. The subjects performed ANB exercise (15 minutes each morning) for 4 weeks. The Cardio-pulmonary parameters were recorded before and after training period of 4 weeks. A significant increment in peak expiratory flow rate (PEFR L/min) and pulse pressure (PP) was noted. Although SBP decreased in significantly, the decrease in pulse rate (PR), Respiratory rate and DBP were significant [103].

Cea Ugarte et al. carried a study on the occurrence of breathing controlled by respiratory cycle comprised of short inhalations and long exhalations. The results showed a significant decrease regarding the baseline parameter for both systolic and diastolic arterial pressure at the end of treatment which had 8 sessions, at six months and at 2 years. The systolic and diastolic values fall within the recommended WHO values in 1999 [104].

Groenier et al. quoted a study on the effect of device guided breathing exercise in Hypertensive patients. A randomised single-blind controlled trial was conducted over a period of 8 weeks to evaluate the effect of this therapy on Blood Pressure and Quality of life. The control group listened to music and used no other therapeutic device. BP AND QOL changes were studied in 30 patients with Hypertension. The effects of respiratory exercise on BP & QOL were not significantly different from these found in the control group. Furthermore 40% of patients did not reach the target breathing frequency, making this device less suitable for clinical practice in patients by means of Hypertension [105].
Pinheiro N et al. conducted a study on Pranayama therapy that improved Cardiovascular control in essential Hypertension patients (n=10, men & women, ages ranging 45-60) with essential HT were seen in an OP setting. Data were collected before and after intervention. The following parameters were assessed: HR variability (HRV), SBP, SBP, mean arterial BP, respirometry, chest expansion measurement & statistical data analysis. Respiratory retraining using the slow breathing technique appeared to be a useful adjunctive for Cardio respiratory control in Hypertensive patients [106].

Naveen K et al. conducted a study on the effect of yoga breathing through a particular nostril on spatial memory scores without lateralized effect. School children (N=108 whose ages ranged from 10 -17 yrs) were randomly assigned to 4 groups. Each group practiced a specific yoga breathing technique: i) right nostril ii) left nostril iii) Alternate nostril breathing or iv) breath awareness without manipulation of nostrils. These techniques were practiced for 10 days. Verbal and spatial memory was assessed initially and after 10 days. All 4 trained groups showed a significant increase in spatial test scores. It showed that yoga breathing increase spatial rather than Verbal Scores [107].

Rajesh P et al. studied to compare mental relaxation and slow breathing as adjunctive treatment in patients of essential Hypertension by observing their effects on BP and other autonomic parameters like HR & Respiratory rate. 100 patients of essential HT either receiving antihypertensive drugs or unmedicated were selected randomly. All parameters were recorded again after mental relaxation and slow breathing. The results showed that even a single session of mental relaxation or slow breathing could result in a temporary fall in BP [108].

Mahajan M et al conducted a study to evaluate the effect of ‘pranayam’ and certain yogic asanas on BP on 132 randomly selected persons. This was an interventional prospective Controlled study in which only the group I underwent a minimum 5 days a week yogic training consisting of Pranayama (breathing exercise) and asanas, each session lasting for one and half hours provided and supervised by a yogic teacher for one month. Following that, the study group
continued to regularly perform yoga for the next 2 months which was monitored by personal contact. The comparison of systolic and diastolic BP at inception and at the end of I and III month between study and control groups produced statistically significant results at the end of the 3rd month [109].

Selvamurthy W et al., conducted a study on 20 male patients of Essential Hypertension (EH) in order to find out whether by restoration of baroreflex sensitivity to normal level either by postural tilt stimulus on a tilt table or by the equivalent yogic postural exercise (Yogic asanas), the EH could be cured or controlled. Group-I (age 34 +/- 1.7 years) was subjected to a 3 week course of 70 degrees head-up tilt for 30 min daily, while in group-II (age 50 +/- 3.3 years), specific yogic exercises equivalent to head-up or head-down tilt were administered for the same duration. At the end of 3 weeks, there was a significant reduction (P < 0.001) in blood pressure in both the groups [110].

2.2.2.2 Studies related to Yoga and BMI

Soubia Malik et al. observed the effect of BMI, BMR, Waist circumference and Waist to hip ratio on Blood pressure. This was a descriptive cross-sectional study involving 100 respondents (93% non-married) selected from Karachi and sample type is stratified random sampling, stratum is based on age i.e. 20-30 years. The findings proved that increased BMI raises the systolic pressure & diastolic pressure; the same results are obtained for WHR, Waist circumference and BMR, as these are directly related to BMI [111].

Alyson R et al., studied the relationship between yoga practice and health (subjective well-being, diet, BMI, smoking, alcohol/caffeine consumption, sleep, fatigue, social support, mindfulness, and physical activity). Cross-sectional, anonymous internet surveys distributed to 4307 randomly selected from 18,160 individuals at 15 US Iyengar yoga studios; 1045 (24.3%) surveys completed. The results revealed that the Mean age 51.7 (±11.7) years; 84.2% female. Frequency of home practice favorably predicted (P < .001): mindfulness, subjective well-being, BMI, fruit and vegetable consumption, vegetarian status, sleep, and fatigue. Each
component of yoga practice (different categories of physical poses, breath work, meditation, philosophy study) predicted at least 1 health outcome ($P < .05$). Home practice of yoga predicted health better than years of practice or class frequency. Different physical poses and yoga techniques may have unique health benefits [112].

_Speroni KG et al._ carried out a study to determine its effect on decreasing body mass index (BMI) in nurse participants by administering the hospital-based Nurses Living Fit (NLF) intervention. The NLF intervention included exercise (12 weekly sessions), yoga and nutrition (4 monthly sessions), and diary completion (exercise/yoga, food/water consumption, and sleep), addressing healthy lifestyle principles. NLF participants experienced a greater mean reduction in BMI and waist circumference inches. The study concluded that Provision of an evidence-based program such as NLF facilitates nurse education on healthy lifestyle principles [113].

_Braun TD et al._ carried out a study to determine the increasing prevalence of overweight and obesity in humans in the United States. Thirty-seven overweight/obese program participants (age 32-65, BMI<25) were undergone a 5-day residential weight loss program, which was multifaceted and based on Kripalu yoga, on health behaviors, weight loss, and psychological well-being in overweight/obese individuals. Self-report weight loss at 1 year (n = 19, 51% retention) was significant. The study concluded that a Kripalu yoga-based, residential weight loss program may foster psychological well-being and weight loss [114].

_Midha T et al._, conducted a community-based cross-sectional study Two-stage stratified random sampling technique was used for 800 subjects (355 men, 445 women) aged 20 years and above, 400 from urban area and 400 from rural area of Lucknow district. The prevalence of hypertension was 32.8% in the urban population and 14.5% in the rural population. The mean blood pressures were 128.4 ± 18.8 mmHg systolic and 82.6 ± 10.2 mmHg diastolic in urban area and 120.5 ± 16.1 mmHg systolic and 77.8 ± 8.8 mmHg diastolic in rural area. A
significant correlation of blood pressure with increasing age was seen. Mean weight, BMI and waist circumference of hypertensives was significantly higher [115].

**Didem A et al.** carried out a study to determine the frequency and risk factors of hypertension among individuals aged 50 years and over, and to examine its effect on the health related quality of life (HRQOL). This population-based cross-sectional study was conducted in two settlements in a region of western Turkey. A questionnaire concerning life habits associated with hypertension, medical histories, and demographic characteristics was filled in by a face to face interview. The SF-36 scale was used to assess HRQOL. Body mass index (BMI) was calculated by measuring the weight and length of the body. The results revealed that 1193 participated in the survey (48.3% men and 51.7% women). The overall prevalence rate of hypertension was 59.5% (n=710), being 58.0% in men and 60.9% in women (P >0.05). The variables that most positively influenced hypertension (P ≤0.05, for each one) were older age (especially the age group of those aged 60 and over), single, no health insurance, consumption of animal fat in meals, and family history of hypertension [116].

**Jafar TH et al.** assessed the Prevalence of overweight and obesity and their association with hypertension and diabetes mellitus in an Indo-Asian population. The study examined 8972 people aged 15 years or more from the National Health Survey of Pakistan (1990-1994). People considered overweight or obese were those with a BMI of 23 kg/m² or greater, and those considered obese as having a BMI of 27 kg/m² or greater. We found that the use of even lower BMI cut off values (21.2 and 22.1 kg/m² for men and 21.2 and 22.9 kg/m² for women) than those recommended for an Indo-Asian population yielded the optimal areas under the curve for an association with hypertension and diabetes, respectively [117].

**Tull S et al.**, assessed the relationship of abdominal obesity and BP. The study examined the elevated BP in a population of black Caribbean women aged 20 -55 yrs. 133 randomly selected women from the island of Barbados comprised the study sample. Data collected included Anthropometric and bp measurements and information about internalized racism, anxiety and depression. The study concluded
that the abdominal obesity should be taken into account as a risk factor. (e.g., Diabetes & CVD) [118].

2.2.2.3 Studies related to Yoga and Cholesterol

Mizuno J & Monteiro HL., conducted a quasi-experimental study describes the effects of a yoga sequence following hemodynamic and biochemical parameters in patients with hypertension. Thirty-three volunteers participated in the study (control = 16 and yoga = 17) for four months. Blood pressure measurements, cardiac and respiratory rate were collected monthly, while the biochemical profile was taken at the beginning and end of the program. The yoga group showed a significant reduction of systolic blood pressure, heart and respiratory rate (p < 0.05). As for the biochemical profile, the yoga group showed correlation coefficients between initial values and final responses greater than the control of fasting glucose, total cholesterol, LDL-cholesterol and triglycerides [119].

Madanmohan assessed the effect of yoga therapy on reaction time, biochemical parameters and wellness score of 15 peri and post-menopausal diabetic patients. A comprehensive yoga therapy program comprising of three times a week sessions for six weeks was conducted. Yoga training reduced auditory reaction time (ART) from right as well as left hand, the decrease being statistically significant (P<0.05) for ART from the right hand. There was a significant (P<0.01) decrease in fasting and postprandial blood glucose levels as well as low density lipoprotein. The decrease in total cholesterol, triglycerides, and very low density lipoprotein and increase in high density lipoprotein was also statistically significant (P<0.05). All the lipid ratios showed desirable improvement with a decrease (P<0.01) of TC/HDL and LDL/HDL ratios and increase (P<0.05) in the HDL/LDL ratio [120].

Okonta NR carried out a evidence-based integrative research review that validates yoga therapy as an effective complementary treatment in the management of high blood pressure (BP). The review was conducted with a search of computerized databases such as OVID, Academic Search Premier, CINAHL, MEDLINE, and Health Source: Nursing/Academic edition, PsychINFO, as well as
reliable Web sites such as the cdc.gov, among others. An integrative review search was conducted, and 10 studies met the inclusion criteria. They include a combination of randomized controlled trials, quasi-experimental studies, and pilot studies. Yoga therapy is a multifunctional exercise modality with numerous benefits. Not only does yoga reduce high BP but it has also been demonstrated to effectively reduce blood glucose level, cholesterol level, and body weight, major problems affecting the American society. The completed integrative review provides guidelines for nursing implementation as a complementary treatment of high BP [121].

**Manchanda SC et.al.** conducted a prospective, randomised, controlled trial of 42 men with angiographically proven coronary obstructive disease were randomized to control (n=21) and yoga intervention group (n=21) and were followed for 1 year. The subjects were taught various yogic exercises at yoga centre which they later practiced everyday at home. The control group was managed by conventional methods. The results revealed that at the end of 1 year, the yoga groups showed significant improvement in number of anginal episodes, improved exercise capacity and decrease in body weight, and total and LDL cholesterol and serum triglyceride levels as compared to controls. Coronary angiography repeated at 1 year showed that significantly more lesions regressed (20% versus 2% and less lesion progressed (5% versus 37%) in the yoga group (chi-square = 24.9; P<0.0001). Revascularisation procedures (coronary angioplasty or bypass surgery) were much less frequent in the yoga group (1 versus 8 patients; relative risk 5.45; P=0.01). The compliance of the total programme was excellent and no side effects were observed [122].

**Kyeongra Yang** conducted a meta analysis on published studies using yoga programs and to determine the effect of yoga interventions on common risk factors of chronic diseases (overweight, hypertension, high glucose level and high cholesterol). A systematic search yielded 32 articles published between 1980 and April 2007. The studies found that yoga interventions are generally effective in reducing body weight, blood pressure, glucose level and high cholesterol. After 4-day residential yoga practice followed by 14 weeks of 1 h daily home practice, one
study found a significant loss in mean body weight from 72.26 to 70.48 kg among subjects with risk factors for coronary artery disease (CAD). Other studies found that yoga was associated with significant weight loss by subjects with CAD and subjects without CAD[123]. Manchanda et al. proved a 7% loss of body weight among adult men with CAD after 1 year of yoga practice, and in a study by Schmidt and colleagues, healthy adults lost an average of 5.7 kg after 3 months of yoga practice.

Similarly, BP dropped significantly during the third week of a 4-week yoga program (1 h per day, 6 days per week), and it fell further after the program. For example, systolic BP dropped from 141.7 to 127.9 mmHg by the third week and to 120.7 mmHg by the fourth week.

All lipid variables except HDL, decreased in beginning of the fourth week of yoga practice (e.g. total cholesterol fell from 206.6 to 193.6 mg dl⁻¹), and the level of total cholesterol continued falling to 176.06 mg dl⁻¹ at 14 weeks. A study of subjects at risk for cardiovascular disease and diabetes found significant improvements ($P < 0.01$) in total cholesterol, triglycerides, LDL, HDL and very-LDL (VLDL, defined as total cholesterol minus LDL minus HDL) after short-term intensive yoga practice (3–4 h per day for 8 days). Notably, for subjects whose baseline total cholesterol was 200 mg dl⁻¹ or higher, the reduction in triglycerides (from $151.5 ± 48.9$ to $132.7 ± 50.5$ mg dl⁻¹, $P < 0.001$) and VLDL (from $36.7 ± 13.8$ to $30.2 ± 14.6$ mg dl⁻¹, $P < 0.001$) was significantly greater than in subjects with lower baseline total cholesterol (triglycerides falling from $113.6 ± 46.5$ to $110.5 ± 38.1$ mg dl⁻¹, $P > 0.05$; VLDL from $23.7 ± 12.8$ to $23.2 ± 12.5$ mg dl⁻¹, $P > 0.05$).

The Lifestyle Heart Trial included asana, pranayama, visualization, meditation, and deep relaxation in addition to a low-fat vegetarian diet, smoking cessation, group support sessions, and aerobic exercise. One year after starting the program, LDL cholesterol levels dropped 40% from an average of 144 to 87 in people who were not taking medication to lower their levels. Remarkably, patients also showed a reversal of the cholesterol plaques of their heart disease. When they
came for retesting after 1 year of the program, the blockages had gotten smaller on their angiograms.

A study conducted at the Yoga Institute in Santacruz, a suburb of Mumbai, looked at 113 patients with angiographically proven cholesterol buildup in their arteries. They were taught Yoga techniques and provided a low-fat diet rich in fiber, vitamins and antioxidants while control patients received standard medical care. One year later the yoga group had a 23% drop in cholesterol (247 to 185) compared to a 4% decrease in controls, and they had a 26% reduction in LDL cholesterol (146 to 108) compared to a decrease of 3% in controls. They also found that patients with even a small decrease in the cholesterol buildup on their angiograms had a major reduction in symptoms.

Prasad KVV et al., conducted a study on normal healthy volunteers, 41 men and 23 women, to evaluate the impact of Pranayama and Yoga asanas on blood lipid profiles and free fatty acids, in two stages. In stage-I, Pranayama was taught for 30 days and in stage-II, yogic practices were added to Pranayama for another 60 days. A Significant reduction was observed in triglycerides, free fatty acids and VLDL-cholesterol in men and free fatty acids alone were reduced in women at the end of stage-I. A significant elevation of HDL-cholesterol was seen only in the men at the end of stage-I[124].

Damodaran A et al., studied the effect of yoga on the physiological, psychological well being, psychomotor parameter and modifying cardiovascular risk factors in mild to moderate hypertensive patients. twenty patients (16 males, 4 females) in the age group of 35 to 55 years with mild to moderate essential hypertension underwent yogic practices daily for one hour for three months. results showed decrease in blood pressure and drug score modifying risk factors, i.e. blood glucose, cholesterol and triglycerides decreased overall improvement in subjective well being and quality of life. yoga can play an important role in risk modification for cardiovascular diseases in mild to moderate hypertension [125].
Manchanda SC et al., conducted a study to evaluate the benefit for patients with coronary artery disease though objective, angiographic studies are lacking. In this prospective, randomized, controlled trial, 42 men with angiographically proven coronary artery disease (CAD) were randomized to control (n = 21) and yoga intervention group (n = 21) and were followed for one year. At the end of one year, the yoga groups showed significant reduction in number of anginal episodes per week, improved exercise capacity and decrease in body weight. Serum total cholesterol, LDL cholesterol and triglyceride levels also showed greater reductions as compared with control group [126].

2.2.2.4 Studies related to yoga and Anxiety

Sheng-Chia Chung et al., conducted a prospective observational cohort study on Sixty-seven (67) participants in the meditation group and 62 participants in the control group. At baseline, the meditation group had higher quality of life (P < 0.001) than controls but similar anxiety level (P = 0.74) to controls. Within-group pre-versus post-treatment comparisons showed significant improvement in quality of life, anxiety, and blood pressure in the meditation group (P < 0.001), while in controls, quality of life deteriorated and there was no improvement in blood pressure. The improvement in quality of life, anxiety reduction, and blood pressure control was greater in the meditation group [127].

Khuwaja AK et al., carried out a study aimed to assess the prevalence of anxiety and depression and to identify their associated factors including metabolic components among people with type 2 diabetes. A cross-sectional, multi-center study of 889 adults with type-2 diabetes were included in this study. Anxiety and depression were measured by using the Hospital Anxiety and Depression Scale (HADS). Overall, 57.9% (95% CI = 54.7%, 61.2%) and 43.5% (95% CI = 40.3%, 46.8%) study participants had anxiety and depression respectively. Factors found to be independently associated with anxiety were physical inactivity, having hypertension and ischemic heart disease. For depression, being female, of older age, having hypertension and ischemic heart disease were significantly associated [128].
Han L conducted a case control study on depression and anxiety in Hypertensive patients. Participants older than 35 years including both hypertensive patients and healthy controls were randomly selected in 2 communities through health Behavior Survey. The results showed that depression and anxiety were possibly associated with Hypertension and more attention has to be paid to the mental health situation of Hypertensive patients inorder to improve their quality of life [129].

Mykletun S et al. studied on the effect of Anxiety on Blood pressure. 36,350 men and women aged 20 – 78 yrs participated in the change in symptom level of Anxiety and Depression between baseline and follow-up was Inversely associated with change in Systolic Blood Pressure. For Diastolic Blood Pressure, the findings were weaker or non-significant. Symptoms of anxiety and depression predicted lower Blood Pressure 11 years later [130].

Jacks H et al., conducted a systematic search on the prevalence of anxiety symptoms, anxiety disorder or specified anxiety disorders in adults aged > 60 in either Community or clinical settings was done. Study concluded that anxiety disorder, particularly Generalised Anxiety Disorder was common and issue related to Co morbidity and the nature of anxiety in old age remained unresolved. This hampered the design of Intervention Programmes and highlighted the need for further research with a primary focus on anxiety [131].

Dahl A., investigated the association of low Blood Pressure with Anxiety and Depression. 60,799 men and women aged 20 -89 years filled in the Hospital Anxiety and Depression Scale as part of a General health study. Slightly weaker Associations were found on low diastolic blood pressure with Anxiety and Depression. This study showed the epidemiological evidence for an association of low Blood pressure with Anxiety and Depression, which is not caused by CVD [132].

Ripaldi L., compared the prevalence of anxiety disorder among patients with essential Hypertension and a control group. The structured clinical interview
(SCID I) was administered to 157 people including 57 essential hypertensive patients (non diabetics, without CVA and or other complications) and 100 control (non hypertensive people that coverage to the hospital). The study reported a higher frequency of anxiety disorder in the Hypertensive group than in the control group (P<0.001) [133].

**Wei et al,** studied the incidence and severity of Anxiety symptoms in patients with Anxiety symptoms in patients with Hypertension. A cross sectional survey in 891 (432 females) hypertensive patients was conducted in a regional community. Zung self rating anxiety scale (SAS) was used to evaluate the severity of anxiety symptoms. In female gender, the duration of Hypertension and the history of hospitalization were associated with the occurrence and severity of Anxiety symptoms in patients [134].

**Kim S.,** performed a study to investigate the effects of a relaxation breathing exercise on Anxiety and Depression on patients with Hypertension. 35 patients were randomly selected, with 18 assigned to an exercise group and 17 assigned to a control group. It consisted of physical exercises combined with relaxation breathing. Anxiety was measured by STAI & Depression was measured by Beck Depression Inventory. The findings indicated that a relaxation breathing exercise would improve Anxiety and Depression levels in patients with Hypertension [135].

**Chaves et al.,** conducted a study to examine the relationship between Anxiety and Blood Pressure levels in women with Hypertension. 78 women under Hypertension treatment at InCor Hospital were studied through Spielberger Anxiety Inventory and Blood Pressure were checked. No significant statistical difference was observed between Blood Pressure and Anxiety levels between Hypertension treatment time and Anxiety levels [136].

**Jong** quoted that the Anxiety was the common cause of excessive Hypertension and therefore antianxiety treatment could be beneficial. 36 patients (28 women and 8 men), mean age 60±2 years (range 36-85 yrs) who were referred
to the emergency room because of excessive Hypertension (>190/100mm Hg) without evidence of acute target organ damage were randomized to receive either oral 5 mg (n=17 study group) or sublingual Captopril. Anti anxiety treatment was effective in lowering Blood Pressure in patients with excessive Hypertension. Thus anxiolytic treatment could be considered in patients with excessive Hypertension without acute target organ damage [137].

Gilbert C et al., stated that breathing training was widely used as an aid in reducing anxiety states, but several other applications also showed promise. This article reviews the evidence that normalizing breathing patterns would offer help in some cases of essential HT, angina, functional chest disorder, COPD and cardiac rehabilitation. Hyperventilation & hypoventilation inhibited breathing and breath suspension were all deviations from an optimal breathing pattern in which breathing volume was closely matched to metabolic needs. Such disordered breathing has varying effects on acid/base balance, arterial diameter and sodium retention by the kidneys. Therefore, a chronic breathing imbalance could contribute to pathophysiology, which would be remediable to an extent by altering habitual breathing patterns [138].

Paternity examined whether Anxiety and Depression were independently associated with elevated Blood Pressure in elderly persons. The study group consisted of 1389 subjects aged 59-71 yrs. Data collected on Socio demographic characteristics, Smoking and drinking habits, medical history and drug use, suggested that anxiety but not depression was independently associated with an increased risk for high Blood Pressure [139].

Rosenman et al., assessed the Anxiety, Stress and CV reactivity (CVR) which was variously believed to play a role in sustained Hypertension. Anxiety correlates poorly with CVR and BP levels. Anxiolytics do not sustain BP lowering in subjects with Hypertension – associated Anxiety. Anti Hypertensives normalize elevated BP but do not alter CVR. The study revealed that CV responses were physiological, rather than psychological and required much stronger
evidence to confirm causal roles of Anxiety, stress and reactivity in sustained Hypertension [140].

**Ingram** studied the symptoms of Anxiety and Depression increase the risk of experiencing Hypertension, using the National Health and Nutrition Examination Epidemiologic Study. A population – based sample of 2992 initially normotensive persons were selected. It showed that Anxiety and Depression were predictive of later incidence of Hypertension and suggested treatment for Hypertension [141].

### 2.2.2.5 Studies related to Yoga and Stress

**Huang Fu-Jung et.al.,** studied the efficacy of a single-session Hatha yoga class on stress reduction. It was a quasi experimental design and recruited 63 female community residents in New Taipei City aged 40–60 years. The experimental group (n=30) received the 8-week Hatha yoga course. The control group (n=33) received no intervention. The Perceived Stress Scale (PSS) and heart rate variability (HRV) assessed stress reduction effectiveness. It showed that Participation in a single 90-minute Hatha yoga class can significantly reduce perceived stress than the control group [142].

A study was conducted to evaluate Medical yoga treatment in patients with stress-related symptoms and diagnosis in primary health care. A randomized, controlled study was performed at a primary health care centre in Sweden in 2011. Patients were randomly allocated to a control group receiving standard care, or a yoga group treated with Medical yoga for 1 hour, once a week, over a 12-week period in addition to the standard care. A total of 37 men and women, mean age 53±12 years, seeking care for stress-related symptoms at the primary health care centre were included and followed up after the 12-week study period. General stress level (measured using Perceived Stress Scale (PSS)), burnout (Shirom-Melamed Burnout Questionnaire (SMBQ)), anxiety and depression (Hospital Anxiety and Depression Scale (HADS)), insomnia severity (Insomnia Severity Index (ISI)), pain (visual analogue scale (VAS)) and overall health status (Euro Quality of Life-VAS (EQ-VAS)) were measured before and after 12 weeks [143].
Smith C et al., compared yoga and relaxation as treatment modalities at 10 and 16 weeks from study baseline to determine if either of modality reduces subject stress, anxiety, blood pressure and improve quality of life. A randomised comparative trial of one hundred and thirty-one subjects with mild to moderate levels of stress were recruited from the community in South Australia. Ten weekly 1-h sessions of relaxation or hatha yoga. Changes in the State Trait Personality Inventory sub-scale anxiety, General Health Questionnaire and the Short Form-36. Following the 10 week intervention stress, anxiety and quality of life scores improved over time. Yoga was found to be as effective as relaxation in reducing stress, anxiety and improving health status on seven domains of the SF-36 [144].

West J et al., quoted a study on the effect of of Hatha yoga and African dance on perceived stress. Sixty-nine healthy college students participated in one of three 90-min classes: African dance (n = 21), Hatha yoga (n = 18), or a biology lecture as a control session (n = 30). Before and after each condition participants completed the Perceived Stress Scale (PSS), There were significant reductions in PSS (P < .0001) such that African dance and Hatha yoga showed significant declines, whereas there was no significant change in biology lecture [145].

Joseph Keawe et al., studied the association of the racism and the physical health of 146 native U.S. populations despite their high risk for stress-related disorders. Height, weight, blood pressure, and salivary cortisol samples (AM and PM) were collected and analyzed. BMI, age, sex, marital status, education level, general psychological stress, and ethnic identity were associated. The results indicated that Native Hawaiians reporting more attributed racism had significantly (P<.05) lower average cortisol levels than those reporting less attributed racism, after adjusting for socio-demographic, biological, and psychosocial confounders [146].

James DL et al., carried out a study on non-sectarian program of meditation training to determine the effects on perceived stress and negative emotion. The study used a single-group, open-label, pre-test post-test design conducted in the setting of a university medical center. 133 Participants learned a simple mantra-based meditation technique in 4, 1-hour small-group meetings, with instructions to
practice for 15-20 minutes twice daily. Instruction was based on a psychophysiological model of meditation practice and its expected effects on stress. Baseline and monthly follow-up measures of Profile of Mood States; Perceived Stress Scale; State-Trait Anxiety Inventory; and Brief Symptom Inventory was assessed. All four outcome measures improved significantly after instruction, with reductions from baseline that ranged from 14% (STAI-S) to 36% (BSI). More frequent practice was associated with better outcome [147].

Jennifer MW et al., conducted a study to examine the impact of coping style, stress, socioeconomic status (SES), and discrimination on health disparities in a large urban multi-ethnic sample. Data from 894 participants were collected via telephone interviews. Independent variables included: coping style, SES, sex, perceived stress, and perceived discrimination. Dependent variables included self-rated general and oral health status. Higher perceived stress was a significant correlate of poorer general health for all ethnoracial groups and poorer oral health for Hispanics and Blacks. SES was directly related to general health for Hispanics (B = .27, P < .05) and Whites (B = .23, P < .05) but this relationship was mediated by perceived stress [148].

Kreitzer MJ and Snyder M conducted a study with complementary therapies and healing practices to reduce stress, anxiety, and lifestyle patterns that are known to contribute to cardiovascular disease. Promising therapies include imagery and hypnosis, meditation, yoga, tai chi, prayer, music, exercise, diet, and use of dietary supplements. Many of these approaches have been within nursing’s domain for centuries and can easily be integrated into the care of cardiovascular patients [149].

Bera TK et al., compared the recovery from induced physiological stress in Shavasana (a yogic relaxation posture) and two other postures (resting in chair and resting supine posture). Twenty one males and 6 females (age 21-30 yrs) were allowed to take rest in one of the above postures immediately after completing the scheduled treadmill running. The recovery was assessed in terms of Heart Rate (HR) and Blood pressure (BP). HR and BP were measured before and every two minutes
after the treadmill running till they returned to the initial level. The results revealed that the effects of stress was reversed in significantly \( (P < 0.01) \) shorter time in Shavasana, compared to the resting posture in chair and a supine posture [150].

**Brown M et al.** quoted a study on the effectiveness of yogic breathing in the treatment of stress and depression. It is a unique method for balancing the autonomic nervous system and influencing psychologic and stress related disorders. SKY is a beneficial, low risk, low cost adjunct to the treatment of stress, anxiety, post traumatic stress disorder (PTSD), depression, stress related medical illnesses, substance abuse and rehabilitation. Proper training by a skilled teacher and a 30 – minute practice everyday will maximize the benefits. Health care providers play a crucial role in encouraging patients to maintain their yoga practices [151].

### 2.2.2.6 Studies related to Hypertension and Need based education

**Aekplakorn et al.** explained the changes in prevalence, awareness, treatment and control of hypertension and their metabolic risk factors in Thai population between 2004 and 2009 conducted by Thai National Health Examination Survey (NHES). Blood pressure and anthropometric measurements were assessed. The prevalence of hypertension in 2004 and 2009 were relatively stable at approximately 21.0%. There was improvement in awareness of hypertension, from 18.2% for men and 33.0% for women in 2004 to 39.5 and 59.4% in 2009, respectively. The high blood pressure control rates improved from 4.8 to 14.4% for men and from 10.8 to 27.2% for women, respectively \( (P<0.05) \). Strengthening measures to control high blood pressure and metabolic risk factors, especially obesity and hypercholesterolemia, in individuals with hypertension are needed [152].

**Proper KI et al.**, investigated the effectiveness of an individual counseling intervention at the workplace on physical activity fitness and health. Counseling content derived from the Patient-centered Assessment and Counseling for Exercise and Nutrition (PACE) program. A total of 299 were randomly allocated into intervention (n =131) and control group (n =168). Over a 9-month period,
intervention group subjects were offered seven counseling sessions. Secondary outcome measures were body composition (body mass index [BMI], and percentage of body fat measured via skinfold thicknesses); blood pressure; and blood cholesterol. There were significant positive effects on total energy expenditure, physical activity during sports, cardiorespiratory fitness, percentage of body fat, and blood cholesterol. Individual face-to-face counseling at the workplace based on PACE protocols positively influenced physical activity levels and some components of physical fitness. The implementation of workplace counseling programs for individuals should therefore be promoted [153].

**Rafique G and Khuwaja AK** carried out a Cross-sectional, analytical study to determine the frequencies of diabetes, hypertension and their established lifestyle risk factors and to assess the level of awareness about diabetes and hypertension amongst persons attending a health mela at the Aga Khan University Hospital (AKUH), Karachi. Height, weight, blood pressure and random blood glucose were measured for 264 participants. Frequency of diabetes and hypertension in both men and women increased with increasing age (P<0.001) and body mass index (P=0.02). Diabetes and hypertension were correctly defined by 52% and 37% subjects respectively and this was significantly associated with educational level (P=.001). Lack of physical exercise was observed in 59% participants, while 53.6% men and 67.5% women were overweight/obese. Emphasis on health education is needed to increase public awareness of the warning signs and risk factors of these common conditions [154].

**Labarthe D and Ayala Cl** undertaken a study to address the relation of various factors to HBP and their potential for preventing and controlling this widespread problem. More emphasis was given on DASH diet. They also emphasis on alcohol consumption, micronutrients/macronutrients, physical activity and inactivity, obesity, cigarette smoking, and alternative approaches to treatment such as stress reduction/biofeedback, yoga/meditation, and acupuncture. Evidence for the efficacy of certain nonpharmacologic approaches to preventing and controlling HBP is strong. This evidence offers a basis for public health policies and clinical approaches that can greatly affect the incidence and consequences of HBP in the
population at large and given educational fact sheets and general information on hypertension [155].

Lisk DR et al conducted a study to determine the prevalence and awareness of hypertension and determinants of blood pressure in rural and urban Sierra Leoneans on 598 subjects from Freetown and 606 subjects from three villages in the northern province of Sierra Leone using multi-stage sampling. All were adults aged 15 years and over. Single blood pressure measurements and Standard anthropometric measurements were measured. The most significant determinants of blood pressure were age, body mass index (BMI) and a low level of education. When adjusted for BMI and age, no significant difference in prevalence was observed between the two populations. The level of awareness was low, particularly in the rural areas. This survey confirms a high prevalence, and low level of awareness, of hypertension in rural and urban Sierra Leoneans. This emphasis that awareness has to be created through educating them about control and prevention of hypertension [156].
PART - III

CONCEPTUAL FRAMEWORK BASED ON ROY’S ADAPTATION MODEL

Nursing theory - Roy’s adaptation model [157] was identified as the most suitable theory and adopted for the study to assess the effectiveness of Yoga and Need Based Education among Adults with Hypertension residing at Kattankulathur Block, Tamil Nadu, India.

According to Sr. Callista Roy, individuals are Bio psychosocial being with an open and adaptive system. As the individuals are open they are constantly subjected to various external and internal stimuli. Apart from external and internal stimuli this also includes innate and acquired stimuli.

Innate and acquired stimuli are the base of the individuals whole being. The internal stimuli especially the needs of the individuals are influenced by innate and acquired stimuli. Intentionally or unintentionally external stimuli are also processed into the individuals systems. These stimuli comprehensively transform the throughput with various adaptive modes.

The commonest adaptive modes identified by the theorist are physiologic, self-concept, interdependence and role functions. When stimuli processed in the input are favourable, the adaptive levels at throughput is enhanced this leads to an adaptive response with the environment by the individuals. This response blends well so as to bring an optimum health in the individual. The theorist also clarifies any input that is not favourable to the individual and that does not blend with the environment cause a maladaptive response where in there is a constant friction between the stimuli and the environment. This makes the individual to deviate from the optimum health. Illness level depends on the intensity, content and the quality of the stimuli. The more these input, the higher and chronic is the level of illness.
Roy also suggests that regulator and cognator effects of the individual allow the person to modify these stimuli there by adapting to the environment. Nurses play a vital role in bringing positive external stimuli to enhance the health of the individual. Showing the ways to adapt to the environment reduces morbidities and mortalities among individuals. She also states nurses play different roles in influencing the external stimuli such as performing various nursing interventions including CAM and providing health education to the individuals.

Considering the theorist views as salient features for the current study, the model was modified to suit the proposed research. The study identifies adults with hypertension are vulnerable for increased BMI, cholesterol, anxiety and stress. The hypertension could be attributed due to various innate and acquired stimuli.

In this study, the researcher identified four innate and six acquired stimuli which constantly interact with the Adult’s system and that can cause increased Blood pressure, Body mass index, Serum cholesterol, Anxiety and Stress among the adults with Hypertension. The innate stimuli include age, gender, education and marital status. The five acquired stimuli are work nature, dietary pattern, any life events following illness during last year, duration of hypertension, anti-hypertensive medications and experience of physical symptoms. These stimuli were assessed along with the levels of blood pressure, BMI, cholesterol, anxiety and stress level. The internal stimuli, the health needs related to hypertension, implicitly influence the health of the adults with hypertension in two groups Study and Control group.

A pre assessment level of Blood pressure, Body mass index, Serum cholesterol, Anxiety and Stress helps the researchers to identify the problems in Hypertension Adults. External stimuli in the form of Yoga was intentionally processed only to study group. It was given until 3 months, during this time the internal stimuli of Needs related to hypertension among Adults are assessed and Need Based Education through Video assisted regarding Hypertension turns to be positive. Yoga being a mind body intervention is a strong input to improve the throughput of the adults at four adaptive levels.
After a regular practice of yoga adults in Study group experience improved sleep, less headache, weight maintenance and reduced cholesterol levels as some of the physiologic adaptation levels.

The self concept including irritability, worry, confused, frightened, nervous and restless will be alleviated leading to improved assertiveness and empowerment as interdependence leading to a level of adaptation. All these three levels form the base, leading to improved role functions. Role functions are seldom changed; vibing well with the environment is necessary at this level.

The role functions are well understood by the Adults with hypertension, the throughput process flows smooth adaptive response. These adaptive levels on reaching a peak bring in the highest possible optimum health there by reducing the levels of blood pressure, BMI, cholesterol, anxiety and stress level. Outcome measurement clarifies the findings. The post test measurement is negative with normal or mild levels of blood pressure, BMI, cholesterol, anxiety and stress level among adults with hypertension. Adults are given constant feedback to maintain and promote health throughout by providing a self instructional module on steps of yoga practice.

Adults in control group are expected to respond negatively because external stimuli yoga and need based education is not given to enhance the adaptive levels. These adults either remain in the same levels of Blood pressure, Body mass index, Serum cholesterol, Anxiety and Stress or worsened based on the intensity of stimuli that they are exposed to. Hence these adults report a maladaptive response to the stimuli. After 12 weeks, these adults also taught about yoga and need based education with a self instructional module about steps of yoga. However the current study considers yoga to decrease the level of Blood pressure, Body mass index, Serum cholesterol, Anxiety and Stress in an effective way when compared to control group as it is a mind body intervention and it provides a holistic approach on the individual well being.
Maladaptive responses in the study group are also expected if the practice is not adequate but reinforcements can improve the practice. The modified framework is in view with the original theorist definition stating individuals are as open system. Any manipulation for betterment of health would bring in positive changes. Yoga being a time tested and effective CAM it can be used as CANIY (Complimentary Alternative Nursing Intervention Yoga). CANIY can be used for managing Blood pressure, Body mass index, Serum cholesterol, Anxiety and Stress among adults and also in many other such situations to achieve adaptive responses and optimum health in the individual especially at the primary health centre level.

Chapterization

Chapter 2 dealt with the overviews of literature that support the study. Part I presents the theoretical literature related to hypertension, Part II presents the empirical literature related to Effect of Yoga on Blood Pressure, BMI, Cholesterol, Anxiety and Stress level, Hypertension and Need based educational intervention and Part III the Conceptual framework of the study.

Chapter 3 deals about the methodology which includes aspects like Research approach, research design, setting population, sample and Sample size, Sampling technique, Criteria for sample selection, Outcome measures, Variables in the study, Method of development of questionnaire, Description of Instrument, Pilot study, Validity of the tool, Reliability, Ethical consideration, Data collection procedure and Plan for Data analysis and drop out analysis.
Figure 2.1 Conceptual framework based on Roy’s adaptation model (1964)
CHAPTER 3