

CHAPTER 2

LITERATURE REVIEW

The literature review is an important part of the research process. For this study, a number of related articles and studies on the following topics are reviewed: stress and hypertension, yoga, and yoga related to stress and hypertension.

1. Stress and hypertension

1.1 Overview of hypertension

Hypertension is a common disorder of adult populations all over the world. It is considered a major health problem leading to death and deformity. High blood pressure develops silently and without warning and is sometimes called the silent killer. Hypertension is commonly defined using both systolic and diastolic blood pressure (World Health Organization Expert Committee, 1996).

Hypertension is defined as a persistent systolic blood pressure of 140 mmHg or greater and/or a persistent diastolic blood pressure of 90 mmHg or greater, or blood pressure less than 140/90 mmHg for those who are taking antihypertensive medication (Joint National Committee, 1997; Monahan, & Neighbors, 1998).

Hypertensive patients are people whose resting values meet the defined values and are repeated and measured by a professional (Organization Expert Committee, 1996: 2-3; Joint National Committee, 1997). The Sixth Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood

Pressure (JNC VI) classified blood pressure of adults aged 18 and older as follows:
(Joint National Committee, 1997: 2417)

Category	Systolic (mmHg)		Diastolic (mmHg)
Optimal	< 120	and	<80
Normal	<130	and	<85
High-normal	130-139	or	85-89
Hypertension			
Stage 1 (mild)	140-159	or	90-99
Stage 2 (moderate)	160-179	or	100-109
Stage 3 (severe)	≥ 180	or	≥ 110

When a patient's systolic and diastolic blood pressure fall into different categories, the higher category should be applied (The Joint National Committee, 1997).

There is a marked biological variation of blood pressure, as blood pressure during sleep and awakening is different and it usually falls at night rather than the daytime (Sternberg, et al, 1995 cited in Kaplan, 1998). The variability of blood pressure is influenced by daytime activities. The study of Clark et al. (1987) in 461 untreated hypertensive patients over 24 hours and five readings were taken within the 24-h recording period. It was found that the lowest pressures occurred during the night and the highest near midday (cited in Kaplan, 1998). Although the blood pressure was higher early in the morning and midday when the estimated effects of the various combinations of location and activities throughout 24-hr period, it was found that no effect on blood pressure of people during work hours (Reeves, 1995 cited in Kaplan, 1998). Therefore the blood pressure in this study was taken at 2-4 PM or after 9 AM before lunch when they were unavailable in the afternoon for the control group while the experimental group was measured at 4-5 PM before practising yoga.

Hypertension is divided into two main categories: primary or essential hypertension, which constitutes ninety-five percent of the incidence of hypertensive patients and whose cause is unknown, and secondary hypertension (Kaplan, 1998; Woods, 2001). The onset of primary hypertension usually occurs in people between 25 and 55 years old (Monahan & Neighbors, 1998). Most of the patients would not have any sign or symptoms but if left untreated it can result in defects in internal organs. Severe or uncontrolled hypertension may cause throbbing occipital headaches upon arising, drowsiness, confusion, visual disturbance, nausea, or vomiting (Woods, 2001:43). Secondary hypertension arises from other diseases, such as renal disease, endocrine disease, tumors of the adrenal gland, pregnancy, vascular problems such as coarctation of the aorta, and use of oral contraceptives (Beyea, 1999; Cunningham, 2000; Woods, Froelicher, Motzer, 2000; Woods, 2001). Although it is rare this form is often severe and difficult to treat.

The actual pathogenesis of essential hypertension remains unknown. Arterial blood pressure is a product of cardiac output and total peripheral resistance. Stroke volume and heart rate determine cardiac output. Autonomic nervous system and circulating hormones control peripheral vascular resistance. Therefore, any factors producing an alteration in peripheral vascular resistance, heart rate, or stroke volume affect systemic arterial blood pressure. Even though the cause of essential hypertension is unknown, one of the factors in the blood pressure equation, peripheral resistance or cardiac output must be changed (Kaplan, 1998; Smeltzer, Bare, 2000). There are multiple risk factors of hypertension (World Health Organization Expert Committee, 1996).

1.1.1 Risk factors of hypertension

1.1.1.1 Family history: individuals whose parents have hypertension have a greater risk of developing high blood pressure at a younger age. Family history of hypertension has been used as an indicator of the influence on the epidemiology of hypertension (Woods, Froelecher, & Motzec, 2000). The genetic predisposition seems to be associated with elevated intracellular sodium levels and lowered potassium-to-sodium ratios (Black, & Matassarini-Jacobs, 1997).

1.1.1.2 Age: the incidence of hypertension increases with age and more than fifty percent of patients older than 60 years have a blood pressure over 140/90 mmHg. Age and hypertension are linearly associated in that the arterial blood vessels become less compliant with age, usually because of the build up of atherosclerotic plaques. Burt and colleague studied people in the United States aged 18 and older, both men and women, and found that blood pressure tended to increase progressively with age (Burt, et al., 1995 cited in Kaplan, 1998). However, the onset usually occurred between age 25 and 55 (Monahan, & Neighbors, 1998).

1.1.1.3 Sex: men experience hypertension at a higher rate and at an earlier age than do women. Men have greater risks of both mortality and morbidity caused by coronary heart disease than do women (Beare & Myers, 1994; Kaplan, 1998; Barrett-Connor, 1997).

1.1.1.4 Race: hypertension is the most serious health problem for Afro-Americans in the United States (Black & Matassarini-Jacobs, 1993). They had more hypertension than Euro-Americans in the United States and have more complications with cerebrovascular disease (Kaplan, 1998). Possible explanations for this higher incidence and severity of hypertension are higher plasma sodium, lower plasma potassium, environmental stressors, and renal lesions (Beare & Myers, 1994).

1.1.1.5 Stress: stress has been conceptualized from both the physiological and psychological perspectives (Koziez & Casey, 1999). Stress can increase peripheral vascular resistance and cardiac output. In some individuals with primary hypertension, a pathologic response to stress causes excessive stimulation of the sympathetic nervous system that produces peripheral vasoconstriction and increased heart rate resulting in increased blood pressure (Monahan, & Neighbors, 1998).

1.1.1.6 Occupation: certain occupations have been characterized as “hypertension prone” because of the stressful nature of the job. Occupations with high levels of pressure and unsatisfying relationships may be sufficiently stressful to cause muscle tone tension, rapid heart rates, and vasoconstriction.

1.1.1.7 Socioeconomic status: another source of stress for human groups is their economic level. Groups who are economically deprived often have a high incidence of hypertension. Poor nutritional habits, low status jobs, frustration and discontentment, and suppression of hostility, can contribute to stress related hypertension. The economic impact of therapeutic regimens is an important consideration. Being unable to afford drug therapy may result in a decreased level of compliance and exacerbate stress levels (Beare & Myers, 1994).

1.1.1.8 Life-style / habits

1) Nutrition: Caloric and energy expenditure leading to obesity as well as intake of sodium is related to hypertension. A high sodium intake may activate blood pressure mechanisms and cause water retention. Other dietary factors such as an adequate intake of potassium (approximately 90 mmol/d, preferably from food source such as fresh fruits and vegetables) should be maintained. Low dietary calcium intake is associated with an increased prevalence of hypertension (Joint Nation Committee, 1997).

2) Smoking: the association between smoking and hypertension remains unclear. Initially, smokers have evidence of an increase in blood pressure because of the vasoconstriction caused by the nicotine. Smoking is also positively associated with increased sugar, alcohol and caffeine (Jacob, 2002). Smokeless tobacco is also associated with hypertension, probably because of its high sodium content (Beare & Myers, 1994).

3) Alcohol intake: the role of alcohol is difficult to assess. A moderate intake of alcohol (more than 2 oz/day) can elevate blood pressure. Recent studies have suggested that the frequency of drinking may contribute more to blood pressure elevation than the amount of alcohol consumed (Beare & Myers, 1994). Herfindal and Gourley (2000) stated that a moderate to heavy alcohol intake increases the incidence of hypertension.

4) Physical inactivity: physical fitness has a role in prevention and control of hypertension. An increased incidence of hypertension is associated with lack of exercise or an exercise level insufficient to produce positive cardiovascular effects. The benefits of exercise include an increase in endorphin secretion, which contributes to one's sense of well being, and an increase in high density lipoprotein level (HDL), which protects against cardiovascular illness.

Risk factors, as already mentioned, are difficult to control especially stress modifiable factors because people interact with many problems in daily life such as work, economic, and family problem in particular during economic crisis. Therefore, appropriate stress management should be performed to reduce risks.

1.1.2 Impacts of hypertension: hypertension is a chronic illness that has the following impact on patients:

1.1.2.1 Physical effect: unfortunately, there are few signs and no symptoms of hypertension until it becomes very severe and causes target organ damage. The morbidity and mortality associated with elevation in blood pressure are predominantly a consequence of damage to target organs including heart, brain, kidneys and retinas (Christensen & Kockrow, 1999; World Health Organization Expert Committee, 1996; Woods, Froelicher, & Motzer, 2000).

1.1.2.2 Psychological effect: hypertension has a psychological impact on patients. Newly diagnosed hypertensive patients are likely to be worried, angry, and in denial due to cognitive appraisal of the impact of diagnosis, and may view the event as threatening (McEntee, & Peddicord, 1987). Individuals with chronic illness have to adjust to their changed lifestyle and the frustrations related to limitations that may accompany their chronic condition. In addition, uncertainty is, perhaps, the greatest psychosocial challenge confronting patients with hypertension. Hwu (1995) found that psychological functioning had the highest degree of impact on patients with chronic illnesses. Furthermore, hypertensive patients with physical problems in relation to disease or side effects of hypertensive drugs may reduce their performance of activities of daily living and occupation (Van-Wissen, Litchfield, & Maling, 1998). This significantly impacts on a patient's psychological functioning, leading to emotional upset.

1.1.2.3 Socioeconomic effect: hypertension is one of the most common chronic diseases. It affects social functioning. Approximately half of the hypertensive patients have experienced changes in their relationship with family and friends as well as changes in types of work, the number of hours spent at work, and the level of responsibility at work. A decrease in working hours and changes in type of work or unemployment are the major socioeconomic effects (Hwu, 1995).

1.1.3 Treatments of hypertension: the goal of treating hypertensive patients is to reduce morbidity and mortality by the least intrusive means. This may be accomplished by maintaining systolic blood pressure below 140 mmHg and diastolic blood pressure below 90 mmHg and controlling other modifiable risk factors for cardiovascular disease (Joint National Committee, 1997). The treatments of hypertension include both nonpharmacological and pharmacological therapy.

1.1.3.1 Nonpharmacological therapy is used for managing blood pressure to a lower level. The information from the Joint National Committee (1997) and World Health Organization Expert Committee (1996) suggested that lower level of hypertension might be useful particularly to prevent stroke, to preserve renal function, and to prevent or slow heart failure progression. In addition, nonpharmacology is beneficial to reduce the cost and side effects of drugs used. The achieved goal may be due to nonpharmacology alone or in combination with pharmacological treatment. The effective nonpharmacology or lifestyle modifications to reduce hypertension are weight reduction, salt restriction, reduction of alcohol intake, smoking cessation, physical exercise, and stress management. Lifestyle modification also leads to risk factor reduction for premature cardiovascular disease.

1.1.3.2 Pharmacological therapy, if nonpharmacological treatment does not work or a patient presents with a very high blood pressure, then medical treatment will be necessary. The goal of treating hypertension is to reduce and maintain blood pressure at less than 140/90 mmHg. Minimization of uncomfortable or disabling side effects of medication is an important consideration. The Joint National Committee (1997) suggest that hypertensive drugs be used to treat patients with systolic blood pressure more than 160 mmHg or diastolic blood pressure more than 100 mmHg, or in some cases, with diastolic blood pressure more than 85 mmHg if there is evidence of

symptomatic target organ damage. The currently available medications for treating hypertension have two main actions: reduction of systemic vascular resistance and decreased volume of circulating blood. The six main drug classes used for the treatment of hypertension are: 1) diuretics; 2) adrenergic inhibitors, of which there are β - adrenergic blocking agents, central α -adrenergic agonists, α -adrenergic blockers, and combined α and β - adrenergic blockers; 3) vasodilators; 4) calcium channel blocking agents; 5) ACE inhibitors; and 6) angiotensin II receptor blockers (Woods, Froelicher, & Motzer, 2000).

1.2 Stress

Stress is a universal phenomenon that means different things to different people in different situations. Different disciplines view the definition of stress differently. Biologists consider stress at a cellular level, whereas engineers view stress in structural terms. When lay people speak of stress, they may say that it is an actual feeling of being overwhelmed. In the social sciences, including nursing, the concept of stress has evolved to include both feeling and the event (Ignatavicius, 1999).

Hans Selye (1976: 14-16) defined stress as the nonspecific response of the body to any demand that is an endogenous or exogenous stressor. Increased demand, to which the body responds both physiologically and psychologically, results in physical, biochemical, functional, and emotional changes.

Lazarus and Folkman (1984: 21) defined stress as “the relationship between the person and the environment that is appraised by the person as taxing or exceeding his or her resources and endangering his or her well-being”.

Joyce (1994: 268) defined stress as the process of adjusting to circumstances that disrupt a person’s equilibrium and stress reactions are physical, psychological, and behavioral responses that an individual displays in times of stress.

Department of Mental Health, Thailand (2002: [www. Nph.go.th](http://www.Nph.go.th)), defined stress as “the changing of physical and emotional status as a result of adaptation to stressors in an oppressive environment or which are emotionally threatening”.

However, in this study, stress is defined based on Selye’s framework as body responses to any stressor placed on it that disrupt a person’s equilibrium. Individuals respond differently in their physiological process as well as in their emotional coping, or adaptation, resulting in varied physical, psychological, and behavioral changes.

1.2.1 The response to stress

The body’s response to stress represents a disruption caused by a threatening stressor. Human response to stress is multifaceted and complex, placing demands on physiological processes as well as an emotional coping (Selye, 1976). The amount of physical and psychological energy required and the effectiveness of the attempt to adapt depend on many factors (Potter & Perry, 2000). The factor that produces stress and disturbs the body’s equilibrium is called a stressor. It can be caused by any increase in demand. Although stress is a state of the body, only the product, that is the changes in the body, can be observed. This response in the body is called the general adaptation syndrome (GAS). It occurs with the release of certain adaptive hormones and subsequent changes in the structure and chemical composition of the body. In addition to general adapting, the body can also react locally; only one organ or a part of the body reacting alone. This is referred to as the local adaptation syndrome (LAS). The adaptation syndrome has three distinct stages (Potter & Perry, 2000):

1.2.1.1 Alarm reaction stage: this is the initial reaction of the body, which alerts the body’s defenses against the stressor. This primary response is short-lived lasting from one minute to 24 hours. During this time, the pituitary gland

produces adrenocorticotrophic hormone, and glucocorticoid hormones are released from the adrenal cortex. In most tissues, protein synthesis is inhibited and protein catabolism is enhanced by glucocorticoids. The effect is to provide substrate for gluconeogenesis. Anabolic activity in the liver is increased; glycogen synthesis and storage are also increased. The fight or flight mechanism is activated mainly through the sympathetic nervous system by releasing epinephrine and nor-epinephrine. These hormones cause vasoconstriction in the skin, viscera, and kidney, resulting in a decreased urine output, dilated iris, unusually increased sweating, and a pale and cold peripheral skin.

1.2.1.2 Stage of resistance: when the body recognizes continued threat, physiological forces are mobilized to maintain or increase resistance to stressors. During this process, immunity is suppressed due to decreased lymphocyte production. The efforts of the body to resist stress may be effectual or ineffectual. Successful adaptation implies positive growth in physical health. Maladaptation during this stage will result in the following.

1.2.1.3 Stage of exhaustion: if the body cannot adapt to the stress in the second stage due to a large stressor and/or extended persistence of the stressor, the stage of exhaustion will occur. If adaptation has not overcome the stressor, the effect of stress may spread to the entire body. At the end of this stage, all energy has been used for adaptation. This third stage can also result in diseases of adaptation, or stress related diseases, and even death. These diseases include cancer, hypertension, myocardial infarction, and anorexia nervosa, (Ignatavicius, 1999).

Sillz (1986 cited in Otrakul, 1995) addressed the response of the body to stress as physiological change. The product of change can be observed in four reactions: emotional, physical, biochemical, and idea and concentration.

1) Emotional reaction: emotional responses include reactions as feeling either positive or negative feelings depending on the stressor. The positive feelings are gladness, cheer or pleasantness whereas negative feelings are anxiety, fear, anger, sadness, or depression.

2) Muscle reaction: muscle responses to stress prepare the body to fight and include stiffness, or clamping of neck, shoulders, jaw, and abdomen. Biochemical reaction: the biochemical changes concern mainly the endocrine hormones, such as hormones from the adrenal glands (epinephrine, norepinephrine, and cortisone) resulting in increased heart rate, blood pressure, and pupil dilatation.

3) Intellectual and concentration changes: these changes reflect decreased thought and minimized concentration, resulting in behavioral changes such as confusion and forgetfulness.

According to Selye (1976) and Sillz (1986), when stress occurs, the body responds to the stressor resulting in physiological, emotional, and behavioral changes. The same stressor does not have the same effect on all individuals and the same stressor may produce different responses in the same individual at different times depending upon conditions. Stress is not just the bad things in life but the good things as well. Likewise, Lavani (2000) stated that, stress is not such a bad thing is such a little makes life challenging, but high stress results in harm (Selye, 1976).

Stress is one of the most complex concepts in health and nursing. It is also associated with manifestations of physical illness (e.g. myocardial infarction, hypertension), emotional disorders (e.g. posttraumatic stress), and social disruption (e.g. divorce) (Boyd, 2002).

1.3 Stress related to hypertension

The hypothalamus mediates a person's response to stress. It activates the sympathetic nervous system to release epinephrine and nor-epinephrine, leading to intense vasoconstriction and increased systemic vascular resistance. Then blood pressure and cardiac workload are increased (Bullock, Vidmar, 1999). While under stress, the hypothalamus also stimulates the posterior pituitary gland resulting in the secretion of antidiuretic hormone (ADH). This hormone promotes water retention, leading to increased stroke volume. ADH also acts as a powerful peripheral vasoconstrictor thereby resulting in increased blood pressure (Frizzell, 1999). In addition, stress usually causes an increase in the level of aldosterone that maintains sodium and water retention along with potassium excretion leading to increased blood volume and blood pressure (Bullock & Vidmar, 1999; Lewis & Lollier, 1992) (shown in Figure 1).

Emotional stress can raise blood pressure acutely (The Joint National Committee, 1997). Cobb and Rose studied air-traffic controllers, who worked under high level psychological stress, and found that they annually develop hypertension greater than nonprofessional pilots who were initially comparable in physical characteristics (Cobb & Rose, 1973 cited in Kaplan, 1998).

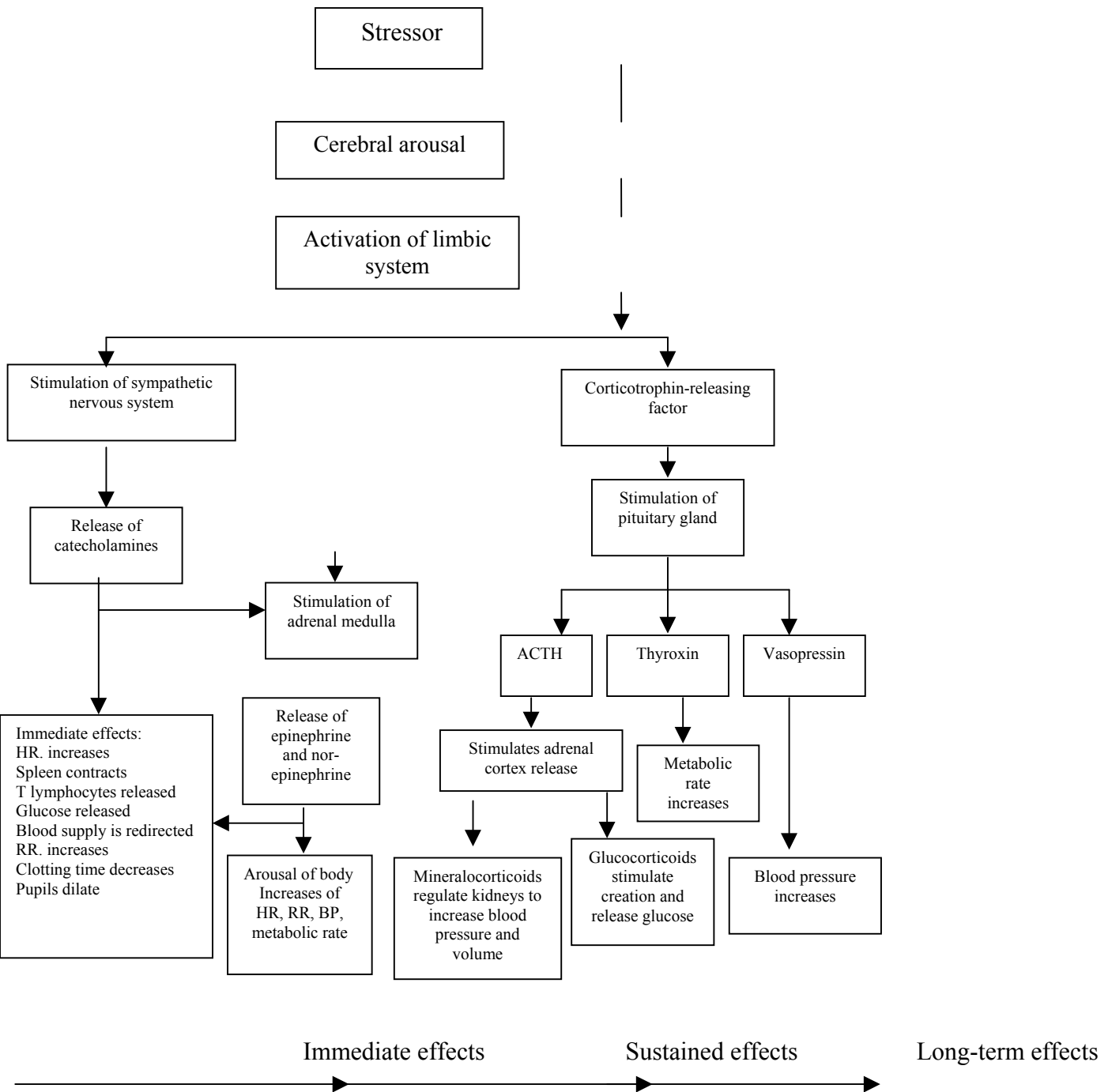


Figure 1: Physiologic stress response and adaptation syndrome

Note. From Medical-Surgical Nursing Across the Health Care Continuum (3rd ed.)(p”94), by D.D. Ignatavicius, M.L. Warkman, and M.A. Mishler. (Eds.), 1999, Philadelphia: W.B. Saunders.

Many factors, both genetic and environmental, cause stress in daily life.

1.3.1 Factors associated with stress in people with hypertension

The stress-illness relationship is a complex process that encompasses different factors. The following factors are regarded as personal factors, influencing stress in people with hypertension.

1.3.1.1 Sex: sex directly affects resource strength and problem-focused coping. According to Gass and Chang (1989), men had greater resource strength than did women, and this contributed to their lower threat appraisal and lower psychosocial health dysfunction.

1.3.1.2 Age: age has direct effects on appraisal, emotion-focus coping, and psychosocial health dysfunction. Older people have lower threat appraisal and use fewer emotional problem coping strategies than younger people because their experience provides greater resource strength leading to lower threat appraisal (Gass & Chang, 1989).

1.3.1.3 Educational level: low education has been marker of low economic status. Besides, education is related to problem-solving and health-related adjustment (Powers & Jalowiec, 1987). A research study on potential explanations for the educational gradient in coronary heart disease found that low education was associated with job stress, poor coping, social isolation and hypertension (Wamala, Mittleman, Gustafsson, & Orth-Gomer, 1999).

1.3.1.4 Occupation: occupation is an operation to earn income, which is a necessity for most people. Personal income gives rise to economic stability, as well as the ability to help others and achieve real degree of happiness. However, the occupation itself can be a source of stress. Some of the conditions that increase stress on the job are fairly common among different groups of workers such

as fear of job loss, work overload, lack of control over one's work, and uncertainty. Therefore, some conditions of the job will be perceived as stressors (Beare & Myers, 1994).

1.3.1.5 Marital status: the married or family setting is an important source of support as spouses will help and support each other, share the tasks, and at least assist to decrease various stresses together (Beare & Myers, 1994). They develop the ability to take care of themselves and their partner. Appropriate spousal support is associated with better psychological adjustment, less feeling of threat, enhanced self-esteem, and facilitates the return to the prior level of social and recreational functioning (Moser & Dracup, 2000).

1.3.1.6 Family income: the income is an indicator of economic and social status. It is the means of providing for the basic needs of daily living of people. Low socioeconomic status is also associated with increased levels of psychological distress (Hwu, 1995; Rozanski, Blumenthal, & Kaplan, 1999).

1.3.1.7 Physical health: it is known that body and mind have a close relationship with each other and cannot be separated (Burkhardt & Nagai-Jacobson, 2001). Hwu (1995) studied the impact of chronic illness on patients and found that most of the subjects felt stress when they had physical illness and developed a negative self-concept. Moreover, diagnosis and illness duration has been shown to be related to psychological functioning.

1.3.2 Assessment of stress response

The stress response is characterized by both physiological and psychological changes. It might be unrealistic to expect a thorough understanding of an individual's stress response immediately after initial contact. Instead, the nurse is expected to increase understanding of the person's stress response and coping patterns through ongoing assessment. During the assessment phase of stress, the nurse might

use a number of stress identification tools, such as Holmes and Rahe's Life Change Scale, Daily Hassles Inventory, Symptom of Stress Inventory, Breeden and Kondo's Anxiety Checklist, a checklist of physical symptoms, thoughts and emotion (Beare & Myers, 1994). Stress Assessment Questionnaire (SAQ) was used in this study. The researcher adopted the Symptom of Stress Inventory (SOS) proposed by Thammakoon with modification. The original questionnaire published in the Cornell Medical Index had been developed by Leckie and Thompson at the Department of Psychosocial Nursing, University of Washington. It had also been translated into Thai by Majorie A. Muecke. This questionnaire consisted of 107 items. Thammakoon later modified the questionnaire and reduced the number of items to 75 to be used for stress assessment in her study (Thammakoon, 1989). The researcher had further modified Thammakoon's version into 64 items and named it the Stress Assessment Questionnaire (SAQ) in order to better fit with hypertensive patients. The questionnaire comprised closed-ended questions. Each item is scored on a 5-point scale from 1 (never) to 5 (very frequently). The total stress score was obtained by the sum of the experience change in physical, emotional, and behavior during the previous one month. The total score was ranged from 64 to 320 and mean score was between 1 and 5. A higher score indicated higher stress.

The reason for using this questionnaire was that it had been used for stress assessment in Thai people, both professional (Thammakoon, 1989; Sutantaphida, 1992) and patients (Taupun, 2000). The items in the tools reflect physical, emotional, and behavioral changes related to stress that might be unrecognized by the subjects under stress.

1.3.3 Stress management

Emotional stress can raise blood pressure acutely (Joint National Committee, 1997). Each day, individuals may encounter stressful situations, as there are so many different types of stressors, such as exposure to heat, cold, noise, and other environmental conditions. Moreover, all lifestyle modifications of hypertensive patients can cause stress. Some people take up over-eating, smoking, and increased use of alcohol to deal with stress. Thus, they may increase their exposure to risk factors. Dealing successfully with stress might require using a variety of techniques including deep breathing, visualization, muscle relaxation, meditation, massage, biofeedback, exercise, music, and yoga (National High Blood Pressure Education Program Working Group, 1993). A meta-analysis of controlled trials found that blood pressure was reduced by 9.7/ 7.2 mmHg with multicomponent relaxation techniques (Spence, Barnett, Linden, Ramsden, & Taenzer, 1999). In this study, yoga practice consisting of yoga asana, pranayama, and deep relaxation was used to deal with stress and further lead to a reduction of blood pressure in persons with hypertension.

2. Yoga

The word yoga is derived from the Sanskrit language. Yoga originated in India more than 6,000 years ago. It is both a science and an art, and comprises techniques that act to promote natural balance of the body, mind and spirit of living (Sakulsak, 2002).

2.1 Definition

Yoga is “an ancient Hindu discipline, which increases mental and physical control of the body, and aims to effect union of the soul with a universal spirit” (Singh, Wisniewski, Britton, & Tattersfield, 1990: 1381).

Patanjali (cited in Garfinkel & Schumacher, 2000: 125) defined yoga as “a technique, which restrains the thought process and makes the mind serene”

Yogendra (2002: 6) defined yoga as “an ancient system of self-development that expedites man’s natural process of evolution. This applies to all departments of one’s life, with special reference to the evolution of consciousness”. Yogendra viewed an individual who lives in a balanced state of body, mind and soul as having a fuller life or being a healthy person. Disease is caused from a state of imbalance between physical, mental and spiritual levels that yoga can deal with the root cause of the problem (Yogendra, 2002: 6-7).

Boonjing (1998: 2-3) states that yoga is a performance for balancing the body, mind and spirit. Counterbalance includes the five elements of asana, pranayama or life force, meditation, relaxation, and nutrition.

Nualjai (n.d.: 11) stated that yoga practice is an applied body, mind and spirit in unity in a state of health. He considered yoga practice as consisting of 5 most important principles. These principles are asanas, pranayama, relaxation, diet, and positive thinking and meditation.

Pancheat (1997: 7) proposed, “yoga is a technique for improving mind to stability and concentration in order to enlighten natural life”. He considered yoga practice in asana, pranayama, and relaxation to direct concentration of mind.

In general, yoga is defined as a performance for balancing of the body, mind and spirit throughout a series of positions (asanas), breathing technique (pranayama), relaxation, right nutrients, and positive thinking and meditation.

2.2 Philosophy of yoga

Yoga is the tradition of spiritual, mental and physical teaching that helps to rejuvenate the spirit, awaken the mind, and nourish the body (Hollar, 2003). Yoga

is also known as a set of physical practices that include gentle stretches, breathing practices, and progressive deep relaxation. These physical practices are intended to ready the body and mind for meditation as well as for a meditative perspective on life. Yoga will help the practitioner achieve the final step of samadhi, or the blissful state of unity with consciousness. It is not provided as a mandate, but simply as a tool, which will pull pranic energy or life force from the cosmic source and eventually lift the energy to higher levels (chakra) within the individual (Cirone, 2002). As a result the balance in energy flow through chakras leads to a sense of health.

2.3 Health and illness

Based on ancient Indian traditional beliefs about human existence, there are five levels or sheaths to existence in health (Nagarathna, Nagendra,& Monro, 1995)(shown in Figure 2).

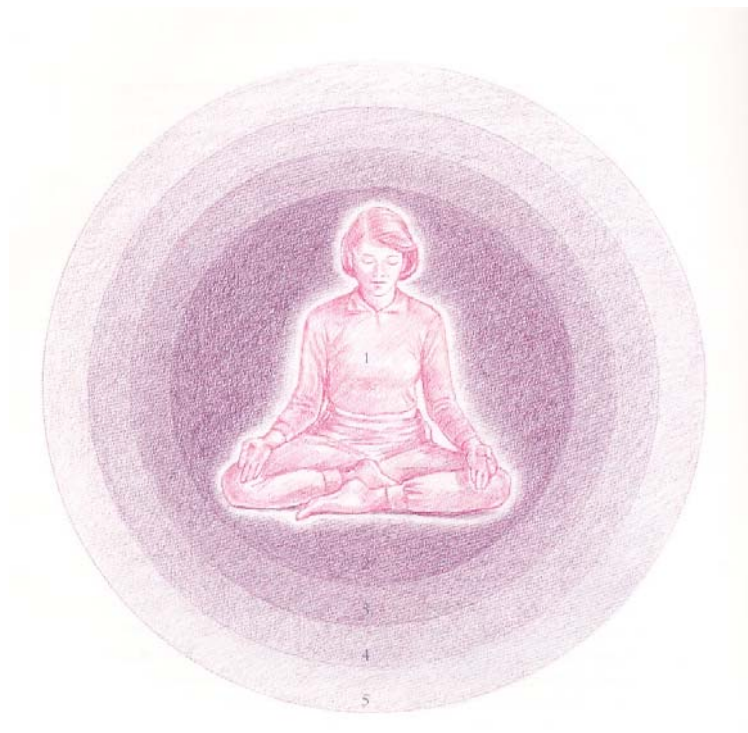


Figure 2: Five sheaths of human existence

Note From Yoga for Common ailments (p”12), by R. Nagarathna, H.R. Nagendra and R. Monro, 1995, New Delhi: Bookwise.

2.3.1 The first sheath is the physical frame that is the physical body, made up and sustained by the food that we eat. Eating wrong food results in an imbalance in this sheath.

2.3.2 The second sheath is the vital body or life force that is made up of prana. This physical body is enlivened by the life or pran that carries out various functions.

2.3.3 The third sheath is the mind that comprises emotions and thoughts. It is responsible for the feeling of emotion and memory.

2.3.4 The fourth sheath is the intellect that is perfect thought and knowledge.

2.3.5 The final sheath is the abode of bliss, which is thought to consist of the positive energy associated with the Divine through a pure blissful consciousness.

It is believed that disease happens through imbalance in the lower three sheaths of existence that is the physical, prana, and mind sheaths that are easily disturbed. The fourth and fifth sheaths are permeated in the universe that cannot be perturbed (Nagarathna, Nagendra, & Monro, 1995). There are two types of physical illness in India philosophy, first are the illnesses with strong physical content such as communicable disease and accidental injury. Second are mental diseases that arise through disturbance in the mind sheath and result in physical illness such as feeling restless, dissatisfaction and anxiety. Living one's life in moderation is thought to keep all five sheaths in balance, which contributes to health and well being (Fontain, 2000). Yoga is a great preventive medicine that helps the body to remove obstacles in the level of the body to the level of pure consciousness (Shrikrishna, 1988). Yoga practice also increases the flow of vital energy throughout the body by opening up and increasing the flexibility of body joints, considered to be chakras. Yoga asanas and breathing techniques allow energy and lymph to flow freely through the entire body resulting in health and enlightenment (Fontain, 2000).

2.4 The branches of yoga

There are several branches of yoga traditionally cited as valid approaches to the goal of self-realization. Yoga is meant to help bring individuals into a state of revelation or enlightenment where they can be realizes their true spiritual identities. Prakash (2002) described the seven traditional branches of yoga:

2.4.1 Hatha Yoga: physical yoga is a branch of yoga which come out of a deep respect and interest in the well being of the body, which is considered a sacred vehicle for the soul. Hatha Yoga uses postures and breathing techniques to help bring the body into a state of peace and health. It attempts to purify the nervous system and strengthen the body to a state of freedom. Accomplished Hatha yogis can remain without food or water for periods of time unreachable by the untrained human being.

2.4.2 Jnana Yoga: yoga of knowledge or wisdom, Jnana yoga is the yoga of the mind of wisdom the path of the sage. This path requires development of the intellect through the study of the scriptures and texts of the yogic tradition. The Jnana yoga approach is considered the most difficult and at the same time the most direct. It involves serious study and appeals to those who are more intellectually inclined.

2.4.3 Karma Yoga: yoga of action is the path of self-transcending action. It works as spiritual service. We practice karma yoga whenever we perform our work and live our lives in selfless action and as a way to serve others. Habitations for Humanity are prime examples of selfless service associated with the karma yoga path.

2.4.4 Raja Yoga: yoga of physical and mental control, Raja means "royal," and meditation is the focal point of this branch of yoga. This approach involves strict adherence to the eight limbs of yoga Sutras. These limbs, or stages, follow this order: ethical standards (yama); self-discipline (niyama); posture (asana); breathe control (pranayama); sensory withdrawal (pratyahara); concentration (dharana);

meditation (dhyana); and ecstasy (samadhi). Raja yoga attracts individuals who are introspective and drawn to meditation. However, although this path suggests a monastic or contemplative lifestyle, entering a monastery is not a prerequisite to practising raja yoga.

2.4.5 Bhakti Yoga: yoga of devotion is the path of love and devotion. Traditionally, this involved the use of external props and external relationships. Rites, rituals and ceremonies comprised the props, and adoration of gurus and an external Supreme Being were the focus of the relationships. The beauty of bhakti yoga is that it is so accessible to anyone, regardless of spiritual development, because the aspirant is free to establish a relationship with God in any form that he finds attractive. In addition, it satisfies the primal craving inherent in the soul of all beings. Bhakti yoga satisfied this urge within a spiritual context, permitting love and devotion to be cultivated and directed in a healthy manner.

2.4.6 Tantra Yoga: yoga to awaken the body's energies, aiming at liberation through ritual, visualization, subtle energy work, and the perception of the continuity of the ordinary world and the transcendental reality. It teaches that there is no gap between the Divine and the world. The Divine can be found in ordinary existence.

2.4.7 Mantra Yoga: the path of Potent Sound, aiming at liberation through the recitation (aloud or mental) of empowered sounds such as om, hum, ram, and hare Krishna.

Additionally, Patanjali Yoga Sutra: Patanjali described Yoga Sutra as the way to attain a state of pure bliss. Yoga was organized into eight limbs. All were systematically arranged to outline lifestyle, hygiene, detoxification regimens, physical, and psychological practices. The eight limbs are eight basic guidelines regarding how to live a meaningful and purposeful life. These are Yama, Niyama, Asana, Pranayama, Pratyahara, Dharana, Dhyana, and Samadhi (Cirone, 2002).

Yama (moral principle) deals with one's ethical standards and sense of integrity. Yamas are universal practices that help you to obtain a nice attitude.

Niyama (moral ideas) allows you to lay a solid fundament in your social life by practising purity, contentment and austerity, and to surrender to the Almighty

Asana (physical postures), allow you to achieve physical health, power and supplement by harmonizing the activity of related energy centers with the physical posture.

Pranayama (energy control), the correct breathing technique, helps to manipulate our energies. Pranayama enables the mind to acquire the capacity to concentrate on any given attention of breathing.

Pratyahara (detachment), it is the time to learn to withdraw from the senses.

Dharana (concentration), allows you to achieve a successful concentration of your mind by focusing attention on a single point.

Dhyana (meditation), is the uninterrupted flow of concentration. When practising dhyana, you can reach an incredible stage of total control of your thoughts.

Samadhi (contemplation), allows the meditator to realize a profound connection to the divine, and the interconnectedness of all living things, the experience of bliss and being with the universe.

In this study yoga was defined as a way to perform for balance of body and mind through yoga asana and pranayama. The practice emphasized physical postures (asanas), breathing technique (pranayama), and deep relaxation in order to receive complete benefit of yoga practice.

2.5 Chakras and human health

The chakra system, which originated in India more than six thousand years ago, describes a main energy center in the body that channels the life force (spiritual power). There are seven major chakras believed to have an effect on the body as the physical manifestation of the spirit, which controls the fluctuating force fields. The chakras are assigned a location in the body but their locations relative to each other remain constant. Each chakra controls a particular area and component factor of the body and is related to endocrine glands. They control the operation of the body and mind through the glands, by stimulating the glands to produce their various hormones. The lower chakras focus on practical matters of life while the upper chakras can be thought of as spiritual (Anandamitra, 2000). The postulated locations of the chakras are shown in Figure 3.

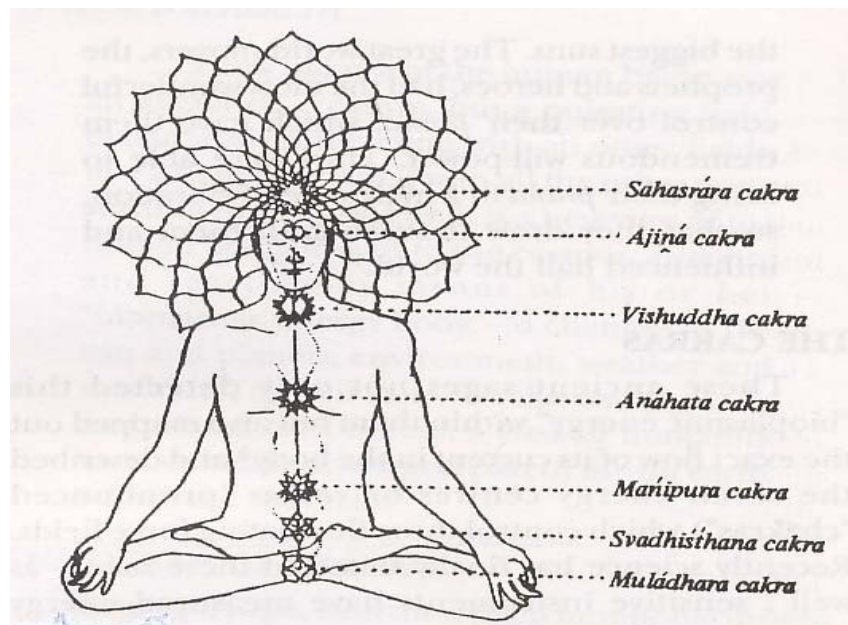


Figure 3: The location of chakras on the human body

Note. From Yoga for health (p"46), by A. Anandamitra, 2000, India: Ananda Marcar.

2.5.1 Mooladhara chakra: located near the base of the body at the end of the spinal cord, at the level of the perineum, which was an area between genital and anal openings. It controls the solid factors in the body and directly relates to gonad functions. Kundalini lies in its dormant state in this chakra before being stimulated (Shrikrishna, 1988).

2.5.2 Swadhisthana chakra: located slightly higher on the spine. It controls the liquid factor of the body and is related to sexual glands and the body's sexual function.

2.5.3 Manipura chakra: located at the level of the umbilicus. It controls the luminous factor of the body and digestion, and is related to the pancreas and adrenal gland.

2.5.4 Anahata chakra: located in the chest at the level of the heart. It controls the aerial factor and is related to respiratory and circulatory functions.

2.5.5 Vishuddha chakra: located in the throat. It controls the ethereal factor and it is responsible for speech. This chakra controls all those below it and coordinates all energies of the physical body.

2.5.6 Ajna chakra: located at the level of midbrow at the center of the brain. This chakra is sometimes called the third eye. It controls the pituitary gland and hypothalamus, and mental function.

2.5.7 Sahasrara chakra: located at center and top of the head. It is related to the pineal gland and is the seat of pure consciousness in humans and controls all chakras below it.

The physical, mental and spiritual health of the individual depends on the balance of energy between these chakras and between all the endocrine glands to, which they are related (Anandamitra, 2000). Yoga asanas will stimulate and re-

energize the energy center and balance the various glands leading to health as well as enlightenment.

2.6 Effect of yogic practice on the human body

Yogic practice has an effect on human life physical, psychological, and spiritual (Nagarathna, Nagendra, & Monro, 1995).

2.6.1 Physiological effect: In human beings, the structure and functions of the body are intimately linked with each other. The yoga practice affects the structures and functions of the human body in many systems.

2.6.1.1 Musculoskeletal system: most yogic practices, especially asanas require fine control over the use of muscles and joints. The performance of yogic practice controls the use of muscles to bring about movement and maintenance of the final position with minimum amount of muscle tone resulting in muscular activity. Muscle activity leads to the skill with steadiness and co-ordination, strength, and stamina. Moreover, some muscles of the body are never used, even in systematic strenuous exercise. Asanas are designed to use all muscles of the given part of the body, thereby preventing atrophy because of poor use, and also restoring their good operation (Anandamitra, 2002). Additionally, the gradual and sustained range of movement through the joints leads to increased flexibility (Shrikrishna, 1988).

2.6.1.2 Cardiovascular system: the twisting and stretching postures of asanas stretch the blood vessels, thus increasing their elasticity and preventing their stiffening and obstruction leading to steady flow of blood providing an even supply to all parts of the body. Thus, stimulated circulation bathes the tissues with nutrients and oxygen and moves waste toxins to maintain the body's tissues in perfect working condition.

2.6.1.3 Endocrine system: the most important glands are the pituitary, pineal, thyroid, adrenal, pancreas and sex glands. The function of these glands is to secrete powerful hormones, which control human growth, weight and size. They also determine metabolism, vitality, sexual vigor and emotional state. As the pituitary and pineal glands are situated in the brain, the headstand and yoga mudra (yoga pose) cause an increase in circulation to the brain, which stimulates the brain's nerve cells and has a powerful effect on them. The pineal gland secretes melatonin and serotonin when it is massaged secreting equilibratory hormone resulting in consciousness and inner happiness (Worrapongpichate, 1999). During the night time serotonin is converted into melatonin that has been claimed to delay aging and increase longevity, improve the body's immune response, reduce aggression, and induce sleep (Singh, 1998). Likewise, the pituitary gland is a master gland that controls all other glands located below it such as sex glands, pancreas and adrenals. The adrenal glands produce a variety of hormones such as adrenaline and mineralocorticoids that are important in controlling individual response to stress and blood pressure. The Bow posture (Dhanurasana) is a powerful stimulant to the adrenal glands to balance adrenaline secretion resulting in calmness (Worrapongpichete, 1999).

2.6.1.4 Digestive system: even if we eat the most nourishing food, it still has to be digested and assimilated properly and the toxins have to be eliminated efficiently. As we age some problems may develop in the digestive system with a gradually reduced efficiency in functioning. The asanas result in an improved blood and nerve supply to the digestive and eliminative systems, which in time will get them, functioning at peak efficiency. The asanas, in particular voluntary lying prone, massage the stomach and lift the digestive organs, as well as contracting and stretching them resulting in perfect functioning (Kulkarni, 2001; Worrapongpichete, 1999).

2.6.1.5 Psychoneuroimmunology system: as well as having a dramatic effect on the brain, spine and glands, most asanas also benefit the internal organs by massaging and stimulating them. This results in healthier internal organs which function better and last longer. Practitioners learn to regulate function such as heart function, respiratory function and mental concentration. The method of control depends on feedback signals between the body and mind (Barrett, 1993). Mind and body interact through nerve cells and hormones. The secretion of hormone is influenced by nerve cells, as well as thoughts and emotions as well. On the other hand, hormones influences and express mental functions and behavior (Singh, 1998). Lymph (Singh, 1998), which is produced by the thymus gland located in the middle of the chest, is essential for the nerve cells and secretion of hormones. Inadequate lymph leads to disorders of the nerve cells and endocrine glands. Practising of yoga asanas massages the thymus gland resulting in adequate production of lymphocytes, which are an essential component of the immune system. Therefore, yoga practices can lead to balance of both mind and body and increased immune function through psychoneuroimmunology interacting with mind and body which is studied through psychoneuroimmunology (Barrett, 1993).

2.6.2 Psychological effect: regular yoga practice creates mental clarity and calmness, increases body awareness, relieves chronic stress patterns, and relaxes the mind and sharpens concentration (Trefny, 2000).

2.6.2.1 Self-awareness: yoga strives to increase self-awareness on both physical and psychological levels. Practitioners learn to induce relaxation and use the technique to help counter feelings of helplessness and depression leading to an engendering of awareness (Trefny, 2000).

2.6.2.2 Mental performance: yogic breathing effectively results in the creation of activity on the opposite side of the brain. Regular practice helps improve communication between the right and left side of the brain. Yoga can also enhance cognitive performance (Worrapongpichete, 1999).

2.6.2.3 Mood change: yogic stretching and breathing exercises have been seen to result in invigorating and restoring proper secretion of hormones leading to emotional balance (Anandamitra, 2000). Also, asanas like the Hare pose in which the head is pressed against the ground, massage the pineal gland in the brain. In this way the production of melatonin is increased and serotonin gradually decreased; thus, the asana develops tranquility and concentration of mind (Singh, 1998).

2.6.3 Spiritual effect: as you achieve yogic spirit, you can begin knowing yourself at peace. Yogic practice leads to increased self-knowledge, especially of a spiritual sort pertaining to grasping something about the nature of the self (Nagarathna, Nagendra, & Monro, 1995).

3. Yoga related to stress and hypertension

Hypertension is a chronic disease that can have a major impact on people; physiological, psychological, and socioeconomic impacts. Diagnosis of hypertension can cause stress; on the other hand, stress can cause hypertension (Hwu, 1995). Yoga practice has been a preventive and curative therapy for both body and mind (Nagarathna, Nagendra, & Monro, 1995). It can help people reduce stress and blood pressure that will further reduce the future risk of major complications such as cerebrovascular and heart problems (Nagarathna, Nagendra, & Monro, 1995). These complications are a leading cause of premature disability and death.

Yoga practice helps bring about a natural balance of body and mind in the state of health. It creates an internal environment that allows the individual to come to his or her own state of dynamic balance or healthiness and it offers instruction and insight into every aspect of life: the physical, the mental, and the spiritual (Nagarathna, Nagendra, & Monro, 1995, Malathi, Damodaran, Shah, Patil, & Maratha, 2000). Many types of yoga have been used to prevent, control, and cure stress, hypertension and related symptoms, such as yoga asana, yoga pranayama and relaxation.

The term asana means steady pose. This is because the yoga asanas (or postures) are held for some time. A set of physical practices includes gentle stretches, breathing practice, and progressive deep relaxation. Practising yoga asana helps to elongate and strengthen muscles. Stretching and range of joint motion also help decrease muscle tension and joint stiffness as well as improve body mechanism (Anandamitra, 2000). The primary concern of yoga practice for many people is simply to increase body flexibility. This is because yoga asana focus on health of the spine, its strength and flexibility. As a result of flexibility and released muscle tension, stress and blood pressure decrease.

Furthermore, the physical movement as a result of yoga asana massages internal organs such as the pineal gland, adrenal glands, thyroid gland, and so on (Trefny, 2000). This will lead to balanced hormone secretion. When adrenal glands are massaged during some asana, such as Bhujangasana and Dhanurasana, it leads to reduced of adrenaline production resulting in calmness and less agitation (Worrapongpichete, 1999). In body calmness the parasympathetic system is dominant resulting in reduced heart and respiratory rate, and reduced blood pressure (Anandamitra, 2000). Additionally, practising some asanas massages the pineal gland in the brain. In this way melatonin secretion is increased and serotonin decreased resulting in

the reduction of aggression and promotion of sleep also. During this state body and mind become relaxed and inner happiness is possible (Anandamitra, 2000; Singh, 1998; Worrapongpichete, 1999).

Yoga asana is not merely physical exercise. It works at a deeper level than the physical body and leads to effectively harmonize physical, mental and spiritual aspects of the person practising it. Yoga asana practice can improve concentration, and establish an awareness of mind that can control the fluctuation of mind, resulting in the quality of calmness (Herrick & Ainsworth, 2000).

In 1998, Selvamurthy, Sridharan, Ray, Tiwary, Hegde, Radhakrishan, and Sinha conducted a study on yoga practice to control essential hypertension in 20 males with essential hypertension. The subjects were divided into a yoga group (yogic exercise- Yoga mudra, Ardha Halasana, Sarvangana, Pavanmuktasana, Bhujangasana, Dhanurasana, Chakrasana, and Savasana), and a tilt group (postured on a tilt table with head up and head down, similar to yoga asana). In the yoga group, subjects practiced yoga daily for three weeks. The study reported that after the end of the 3rd week, there was a significant fall in both systolic and diastolic blood pressure, and heart rate. Besides, the study reported that blood pressure showed a gradual decline from the 5th day of yoga practice and returned to near normal level at the end of the course, whereas, in the tilt group blood pressure significantly declined on the 9th day of the course. In addition, the study showed that the level of blood catecholamines had significantly decreased after yoga course indicating that yogic exercise was associated with an improvement in the control of hypertension.

As a whole, yoga asanas work at a much deeper level than the preceding exercises. They release practitioner muscles and joints, and holding the postures and tone of the muscles, massage internal gland and promote better breathing. Circulation

is increased and the nerves are ensured of their supply of nutrients and oxygen. The asanas also release the flow of energy within the human being through the highest chakras, and relax muscles that act to calm the mind (Nagarathna, Nagendra, & Monro, 1995). There are many asanas invented by yogis to affect different glands and chakras, and thus to affect the mind and body in various ways. One cannot know the subtle effects of asanas on the body or which postures to choose in order to correct the imbalance of body and mind. Therefore, yoga asanas must be prescribed like specific medicine and individualized. Practising asanas must be guided by yogis' teacher or the guidance of a trained teacher in order to reduce the risk of harm. In particular, hypertensive patients should avoid the asanas that induce blood pressure and heart rate. The asanas used in this study consisted of 14 postures- Lotus pose, Symbol of Yoga, Joints exercise, Corpse pose, Crocodile pose, Cobra pose, Bow post, Fish post, Thunderbolt pose, Head-To-Knee pose, Twisting pose, Mountain pose, Wheel pose, and Symbol of the embryo (shown in Appendix E).

Pranayama or yogic breathing is an important component of yoga practice to manage stress and blood pressure. Pranayama is a term consisting of two parts: pran and ayama. Pran is an auto-energizing force that creates magnetic field in the form of the universe and play with it. Ayama means breath control (Worrapongpichete, 1999).

Control of breath of pranayama can harmonize the flow of prana to the higher chakras. Those who practise systematic and deep breathing can feel the tremendous vitalizing effect of the absorption of prana. Moreover, breathing techniques also produce a sense of equilibrium, rebalancing, and slowing down the physical body resulting in calmness both of body and mind (Anandamitra, 2000). This calmness leads to reduction of sympathetic activity resulting in blood pressure, heartbeat, and respiratory rate reduction (Nagarathna, Nagendra & Monro, 1995). Pranayama practice

can alter metabolism and autonomic activities. In 1994, Telles, Nagarathna, and Nagendra conducted a study on breathing through a particular nostril. Forty-eight male subjects were randomly assigned to three groups. Each group practiced different pranayama- right nostril, left nostril, or alternate nostril; 27 respiratory cycles repeated 4 times a day for one month. The result demonstrated that breathing selectively through the left nostril, or alternate nostril increased in the baseline level of volar galvanic skin resistance indicating a reduced effect on sympathetic activity, where as, right nostril pranayama induced effect on sympathetic activity. Moreover, previous research found that the practice of Nadi-shodhana pranayama for four weeks could decrease heart rate as well as systolic and diastolic blood pressure (Bhargava, Gogate, & Mascarenhas, 1988 cited in Raghuraj, Ramakrishnan, & Nagendra, 1998). This is because pranayama is the breathing process that controls the motion of inhalation, exhalation and retention of vital energy. During pranayama, inhalation stimulates the system and fills the lungs with fresh air; while retention raises the internal temperature and plays an important part increasing the absorption of oxygen. Exhalation causes the diaphragm to return to the original position toxins and impurities are forced out by the contraction of intercostal muscles. Controlling the breath is essential to a yogic practice and begins with opening the lungs to inhale and exhale fully- resulting in maximizing the amount of vital energy absorbed with every breath (Anandamitra, 2000). The connecting of the respiratory system with the autonomic nervous system is an integral part of yoga that begins the process of developing prana or energy. The nervous system is toned by pranayama practice, as enhanced pranic flow reduces stress and increases strength. In addition, proper control of breathing dissolves emotional tensions and relaxes the mind, increases concentration and self-control, and accelerates spiritual development (Anandamitra, 2000). There are three different types of breathing: abdominal,

thoracic, and clavicular. In natural breathing we use all three types at once, so all the muscles are involved in exercise. There are various types of pranayama. Some of the popular forms are Ujjayi, Shitali, Nadi-shodhana, Kapalabhati, Chandrabhedana, Suryabhedana, Bhastrika etc. There are variations in performing different pranayama. Some of them can be done in a sitting position while others are done in a standing or lying position. Although practice of pranayama can alter autonomic activities (Telles, Nagarathna, & Nagendra, 1994), practicing pranayama with rapid breathing (Kapalabhati) can increase sympathetic activity (Raghuraj, Ramakrishnan, & Nagendra, 1998). Therefore, practice of pranayama in hypertension should be done by following relaxation and strengthening breathing muscles in a balanced way as well as using a minimum of effort. For this reason, alternate-nostril breathing is recommended for use to harmonize the flow of pran in people with hypertension. In this study Nadi-shodhana pranayama was performed to reduce stress as well as blood pressure. The technique was performed as shown in Appendix E.

Deep relaxation in yoga practice is another important component that leads to a reduction of the sympathetic activity and therefore the blood pressure. Relaxation is necessary for good health and peace of mind. Without proper relaxation the body and mind become overworked and inefficient. It is more inclusive in general relaxation that tends to concern itself with the muscular system and sometimes emotion (Crisp, 2002). At the same time, yoga relaxation itself is concerned with physical, mental and spiritual relaxation (Forrington-Burke, 2002).

Physical relaxation: certain forms of exercise increase the body's energy, but if we continue to waste energy by constantly keeping the muscles in a state of readiness when there is no need to do so, it is futile and trains muscles to be tense. Yoga asanas are techniques for maintaining the muscles ability to relax. People who

practise yoga asanas often find that they feel more rest or physical relaxation, leading to relaxation of both body and mind and resulting in a reduction of sympathetic activity and promotion of parasympathetic activity. As a result, blood pressure, heart rate, respiratory rate and metabolic rate are decreased. The effects of relaxation on stress and blood pressure were apparent in the study by William III (1990 cited in Marti, 1995). In his study, 192 men and women participated in an experiment on relaxation, meditation, and breathing exercise to manage their stress for eight weeks. Those practising relaxation and breathing correctly had blood pressures significantly lower than those who did not practise.

Mental relaxation: when the mind is constantly bombarded by stimuli, it becomes overloaded and exhausted. We may be unaware what we are doing by thinking and worrying, so using up tremendous amounts of energy and creating tension. These tensions impose worries or imaginings on the mind leading to a greater use of energy than physical work. When worries get out of hand, energy resources are strained; mental fatigue sets in, often resulting in wear and tear on the physical body. It is important to set aside the time for the mind to unwind and recoup by breathing slowly and rhythmically for a few minutes while concentrating on the breath. It develops the ability to calm the mind by using one's own thought power and can lead to an experience of inner peace with physical relaxation following the mental relaxation (Forrington-Burke, 2002). Bera, Gore and Oak (1998) studied the recovery of yogic relaxation posture on physiological stress. They found that a yogic relaxation posture (Shavasana or Corpse) significantly reduced physiological stress in a shorter time as compared to other relaxation techniques (chair sitting, or lying down in a supine position). Malathi and Damodaran (1999) studied the role of yoga on stress due to exams in medical students. The study was conducted in 50 medical students who were divided into

control and yoga groups. The yoga group follows the program for one hour three times a week for three months. The result showed a statistically significant reduction in anxiety among the yoga group. Moreover, yoga was shown to improve self-confidence, concentration, good interpersonal relationships, and give a better sense of well being.

Spiritual relaxation: complete mental and physical relaxation come only with an inner tuning to a higher source. There will always be tension and worry about the future. Turning to the divine source brings the realization that all happiness comes from within. Yoga provides the techniques for this inner tuning, enabling us to break down the boundaries that separate us from each other and self. This technique leads to a peaceful and joyful self through the identification with the self, which completes the process of relaxation.

There are two relaxation techniques, quick relaxation technique and deep relaxation technique. The quick relaxation technique takes five minutes, with the corpse pose for lying on the back and the crocodile pose for lying face down (Nagarthna, Nagendra & Monro, 1995). It is usually used after doing asana or exercise. The aim of this is to reduce minor fatigue. On inhalation the body is felt to be light and energetic, whereas, on exhalation the feeling of enjoyed relaxation and strengthening energy is expressed. The deep relaxation technique takes ten to twenty minutes using the corpse pose. Deep relaxation can lead to a rapid fall in blood pressure and pulse rate and reduces the strain on the heart. It also reduces muscle tension and produces more energy (Anandamitra, 2000). Furthermore, deep relaxation completely calms the body and mind. Remaining in this position for a period of time creates the feeling of being refreshed in body, mind and spirit. Additionally, hypertensive patients should practice deep relaxation daily for at least ten minutes (Nath, 1992).

Yoga is usually used in combination; for instance, Hatha yoga (yoga asanas in combination with pranayama), or asana combined with pranayama and deep relaxation (Satyanarayana, Rajeswari, Rani, Krishna, & Rao, 1992). Other studies relating to the benefits of yoga practice are:

Sonchan (1998) studied the effects of Hatha yoga on aggressiveness of Mattayom Suksa 2 students, randomly assigned to control and experimental groups. Six students participated in Hatha yoga for 60 minutes per day for 8 weeks. The results showed that the effects of yoga in reducing in aggressiveness could be observed within 8 weeks. Practising asanas and pranayama helped relaxation of body and mind and at the end of asanas deep relaxation was performed through Corpse pose to receive complete benefit from asanas.

Satyanarayana, Rajeswari, Rani, Krishna, and Rao (1992) studied the effects of Yogic breathing and relaxation on certain psychophysiological parameters. The study showed that eight healthy male volunteers practising yoga 50 minutes daily for 30 days had a gradual but significant decrease in body weight and an increase in alpha activity of the brain, indicating increased calmness ($p < .001$). In addition, the study reported that yoga practise significantly decreased respiratory rate on all practice days ($p < .05$). But, other physiological parameters including blood pressure and heart rate did not significantly alter.

In 1999, Muragasan, Govindarajulu, and Bera studied in thirty-three people with hypertension aged 35-65 years. They combined asanas and pranayama practice to manage hypertension. The subjects were randomly assigned into three groups. The first experimental group underwent selected yogic practices, the second experimental group received medical treatment by physicians, and the last was the control group, which did not participate in any treatments. In the yoga group, the participants

practiced one hour per day, six days a week for eleven weeks. They found that participants in the yoga group and the group treated with drugs showed a significant reduction of blood pressure and heart rate whereas the control group did not show significant improvement.

Yoga has also been used in combination with other therapies. In 1996, Khanam, Sachdeva, Guleria, and Deepak studied the effect of yoga training on pulmonary and autonomic functions of asthma patients. Nine bronchial asthma patients trained in yoga for seven days in a camp, and their parasympathetic reactivity, sympathetic reactivity, and pulmonary function were measured. Sympathetic reactivity was significantly reduced by as seen by the reduction of diastolic blood pressure, heart rate, and improved pulmonary function. In the study of Telles, et al. (1997), they compared the changes in autonomic and respiratory parameters of 28 girls after yoga and games at a community home. They were randomized as 14 pairs assigned to yoga or game group. At the end of an hour's activity daily for six months, both groups showed a significant decrease in resting heart rate relative to initial values, and the yoga group showed a significant decrease in respiratory rate, which appeared more regular, but was not seen in the game group.

In 1997, Bowman, Clayton, Murray, Reed, Subhan, and Ford studied the effects of yoga and aerobic exercise training on baroreflex in healthy elderly people. Twenty-six normotensive elderly were the subjects; 14 subjects completed aerobic training and 12 subjects completed yoga. At the end of the study period of six weeks, they reported that heart rate decreased ($p < .05$) and alpha index at high frequency reflecting parasympathetic activity increased ($p < .01$) in the yoga group but not the aerobic training group.

Schmidt and colleagues (1998) studied a comprehensive residential three months kriya yoga training and vegetarian nutrition program to change the cardiovascular risk factors and hormone levels. The yoga course was performed by the 38 participants of the program who were eating a vegetarian diet, whereas, the control group were living normally. The study reported at the end of three months that blood pressure as well as heart rate were significantly reduced during the course of yoga.

Malathi, Damodaran, Shah, Patil, and Maratha (2000) studied the effect of yogic practice on subjective well being. The study reported that forty-eight healthy volunteers participating in practice of yoga over 4 months showed significant improvement in subjective feelings of well being and quality of life and satisfaction about their achievements in life.

In 2003, Lee, Mancuso, and Charlson conducted a study about the expectations and outcomes associated with yoga practice. One hundred and seventy one new participants recruited into a course of three-month yoga, reported a wide and comparable variety of outcomes of yoga practice, including improved emotional well-being in 61 percent, less stress (56%), and more energy (53%).

Summary

In summary, the literature review of studies related to yoga and hypertension showed that the primary goal of treatment of hypertension was to achieve the maximum reduction of blood pressure to below 140/90 mmHg, to minimize the risk of complications as well as reduce the cost and side effects of drugs used. Nonpharmacological therapy such as yoga practice should be recommended because it has many benefits; especially practising yoga asana, pranayama and relaxation which helps to restore the natural balance of body and mind resulting in calmness and

further reduction of the sympathetic activity. Through this process, stress and blood pressure can be reduced.