CHAPTER I

INTRODUCTION

“Physical activity is probably the most enjoyable and yet most inexpensive form of preventive medicine” (Larry, 1981).

Physical inactivity is considered more dangerous than the physical activity. When life has become convenient beyond our dreams, when physical exertion threatens to become absolute, we pay more attention to our television sets, dish washers, washing machines, vacuum cleaners and other machines. Young and old people in our country do not get enough exercise. Modern city is drifting away from the habit of physical work. Most of our work is done by a machine or a computer and a person has to simply sit and watch the work done by them.

In the present day conditions keeping good health is becoming more and more difficult and diseases are proliferating. In today’s society from top to bottom with televisions, computers, motor cycles, cars. Most people do not practice sufficient physical exercise to maintain adequate strength, stamina, energy and health. In fact many people have become so sedentary, that their life style has become a serious threat to their health and physical fitness.

In the nuclear era, in which we live, all the latest inventions meant for our welfare seem to do as harm. Many technological advances are intended to alienate physical exertion from everyday activities. The automobile, electronic and electrical equipments are the contributors to our sedentary life style.

Physical exercise must be as much valued as food because it completes the assimilation of food through its action on the function of the vital organs of the body. It is universally recognized that sports, games and yoga have always been the enchanting offshoots of human instinct to enjoy life and be happy. Yogasanas and physical education increase the scope of human abilities that enrich the life of the individual and that of the society as a whole. Yoga and physical exercise are essential part of the human resource development.
1.1 Fitness

“Fitness is the ability of an individual to live a full and balanced life; it involves physical, mental, emotional, social and spiritual factors and a capacity for their wholesome expression” (Charles, 1978).

Fitness is one’s richest possession. It cannot be purchased. It has to be earned through regular and systematic fitness program and good habits. Fitness is a complex whole which includes physical, mental, moral and spiritual well being.

1.1.1 Physical Fitness

Physical fitness is the capacity of the heart, blood vessels, lungs and muscles to function at optimum efficiency (Bud and Getchell, 1976). In previous years, fitness was defined as the capacity to carry out the day’s activities without undue fatigue. Automation, increased leisure time, and changes in lifestyles following the industrial revolution meant this criterion was no longer sufficient. Optimum efficiency is the key. Physical fitness is now defined as the body’s ability to function efficiently and effectively in work and leisure activities, maintain healthy, resist hypo kinetic diseases, and face emergency situations.

Physical fitness is the capacity to carry out, reasonably well, various forms of physical activities, without being unduly tired and includes quality which is important to the individual’s health and well being. The vigor of the individual depends upon his fitness for the task at hand and basic to any task is fitness for living itself.

Physical fitness makes one feel mentally sharper, physically more comfortable and more in tune with body and later able to cope with the demands of everyday life (Gordon and Jackson, 1985). Physical fitness as defined by the World Health Organization as “the ability to perform muscular work satisfactorily”.

1.2 Hypertension

A general definition of hypertension is persistently high arterial blood pressure, the force exerted per unit area on the walls of arteries. To be defined as hypertension, the systolic blood pressure (SBP), the blood pressure during the contraction phase of the cardiac cycle, has
to be 140 mm Hg or higher; or the diastolic blood pressure (DBP), the pressure during the relaxation phase of the cardiac cycle, has to be 90 mm Hg or higher, and they are reported as 140 / 90 mm Hg. The normotensive individual has a blood pressure of less than 120 mm Hg and a diastolic blood pressure of less than 80 mm Hg; read as a blood pressure of 120/80.

1.2.1 Classification of hypertension

Hypertension is divided into two categories: primary and secondary of individuals with hypertension, 95% have primary or essential hypertension, which means that the cause of hypertension is not known. The remaining 5% have secondary hypertension due to endocrine or renal abnormalities.

In the seventh report of the Joint National Committee on Prevention, Detention, Evaluation, and Treatment of High Blood Pressure (Chobanian et al., 2003), hypertension is classified in stages based on the risk of developing CVD (Table.1.1)

**TABLE-1.1. CLASSIFICATION OF HYPERTENSION**

<table>
<thead>
<tr>
<th>Classification*</th>
<th>Systolic BP(mm/Hg)*</th>
<th>Diastolic BP (mm/Hg)*</th>
<th>Management*</th>
<th>Initial Drug Therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Lifestyle modification</td>
<td>Without Compelling Indication</td>
</tr>
<tr>
<td>Normal</td>
<td>&lt; 120 and &lt; 80</td>
<td>Encourage</td>
<td>No anti hypertensive drug indicated</td>
<td>Drug(s) for compelling indications</td>
</tr>
<tr>
<td>Prehypertension</td>
<td>120 – 139 or 80 -89</td>
<td>Yes</td>
<td>Thiazide – type diuretics for most; may consider ACE inhibitor, ARB, CCB, or combination</td>
<td>Drug(s) for compelling indications. Other antihypertensive drugs(diuretics, ACE inhibitor,ARB,CCB)as needed</td>
</tr>
<tr>
<td>Stage 1 hypertension</td>
<td>140 – 159 or 90 -99</td>
<td>Yes</td>
<td>2 – Drug combination for most (usually thiazide-type diuretic and ACE inhibitor or ARB or β-blocker or CCB)</td>
<td>Drug(s) for compelling indications. Other antihypertensive drugs(diuretics, ACE inhibitor, ARB, β-blocker, CCB) as needed</td>
</tr>
<tr>
<td>Stage 2 hypertension</td>
<td>≥160 or ≥100</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Treatment determined by highest BP category
Individuals diagnosed with pre-hypertension have a SBP between 120 and 139 mm Hg or a DBP between 80 and 89 mm Hg, and they are at high risk for developing essential hypertension (hypertension of unknown etiology) and CVD. Stage I hypertension (140 to 159/90 to 99 mm Hg) is the most prevalent level seen in adults. In other words, this is the group most likely to have a myocardial infarction or stroke. The defining point for hypertension is arbitrary because any level of elevated blood pressure is associated with increased incidence of CVD and renal disease. Therefore, normalization of blood pressure is important for all stages of hypertension. Hypertension is a major risk factor in the development of many other diseases. The risk of complications doubles for each 6 mmHg increase in the diastolic blood pressure preventing those diseases is the goal of therapy (Brian and Ripoll, 1999).

1.2.2 Patho physiology

Blood pressure is a function of cardiac output multiplied by peripheral resistance (the resistance in the blood vessels to the flow of blood) the diameter of the blood vessel markedly affects blood flow. When the diameter is decreased (as in atherosclerosis) resistance and blood pressure increase. Conversely, when the diameter is increased (as with vasodilator drug therapy), resistance decreases and blood pressure is lowered.

Many systems maintain homeostatic control of blood pressure. The major regulators are the sympathetic nervous system (for short – term control) and the kidney (for long – term control). In response to a fall in blood pressure, the sympathetic nervous system secretes nor epinephrine, a vasoconstrictor, which acts on small arteries and arterioles to increase peripheral resistance and raise blood pressure. The kidney regulates blood pressure by controlling the extracellular fluid volume and secreting renin, which activates the renin – angiotensin system. When the regulatory mechanisms falter, hypertension develops.
Patho physiology and care management algorithm (John and Sanford, 2002)

**Etiology**

- Overweight
- Excess alcohol consumption
- Low K, Mg, and Ca intake
- Stress
- Excess sodium consumption
- Physical inactivity
- Elevated Systolic and/or Diastolic blood pressure
- Vascular inflammation

**Pathophysiology**

**Diagnosis of Hypertension**
- Prehypertension
  - Systolic BP 120 - 139 mm Hg
  - Diastolic BP 80 – 89 mm Hg
- Systolic BP > 139 mm Hg
- Diastolic BP > 89 mm Hg

**Target Organ Disease**
- Cardiac
- Cerebro vascular
- Peripheral
- Renal
- Retinopathy

**Management**

**Medical Management**

**Anti hypertensive Drug Therapy**
- Diuretics
- Beta blockers
- Vasodilators
- ACE inhibitors
- Calcium channel blockers
- Receptor blockers

**Lifestyle Modification**
- Exercise
- Stress reduction

**Nutrition Management**
- Weight reduction
- Adopt a DASH eating plan
- Dietary sodium restriction to 2.3 g/day or less
- Moderation of alcohol consumption
- Nutrition education
1.2.3 Primary Prevention

The National High Blood Pressure Education Program (NHBPEP) is one of the most successful prevention programs in the twentieth century (Moser, 2002). Through educational efforts the detection, awareness, and treatment of hypertension have improved over the 35 years since its inception. These changes have contributed to the decline in cardiovascular mortality seen during the same time period.

Primary prevention of hypertension can improve quality of life and costs associated with medical management of hypertension and its complications. A strategy for the population would be to reduce blood pressure in those with pre hypertension (above 120/80) but below the cut points for stage 1 hypertension. A downward shift of 3 mm Hg in SBP would decrease the mortality from stroke by 8 % and from coronary heart disease by 5 % (Appel, 2003). Persons at highest risk should be strongly encouraged to adopt healthier lifestyles.

Changing lifestyle factors has documented efficacy in the primary prevention and control of hypertension. These factor include losing weight if overweight; limiting alcohol intake; adopting a dietary pattern that emphasizes fruits, vegetables, and low – fat dairy products; reducing fat, especially saturated fat, and cholesterol; reducing intake of dietary sodium; increasing physical activity; and stopping smoking (NIH, 2004). In individuals with normal blood pressure, modification of these lifestyle factors has been shown to lower blood pressure and thereby has the potential to prevent hypertension and lower the risk of blood pressure – related complications. A substantial body of evidence strongly supports these lifestyle modifications as a means of significantly lowering blood pressure in individuals with hypertension.

1.2.4 Medical management

The goal of hypertension management is to reduce morbidity and mortality from stroke, hypertension – associated heart disease, and renal disease. According to the JNC 7 recommendations, three objectives for evaluating patients with hypertension are to (1) identify the possible causes; (2) assess the presence or absence of target organ disease and clinical CVD; and (3) identify other CVD risk factors that will help guide treatment (NIH, 2004).
Weight history; leisure time physical activity; and assessment of dietary sodium, alcohol, saturated fat, and other patterns (e.g., intake of fruits, vegetables, and dairy products) are essential components of the medical and diet history. The presence of risk factors and target organ damage determines treatment aggressiveness. Lifestyle changes are primary therapy in all patients with hypertension. However, pharmacologic therapy is necessary in many.

1.2.5 Pharmacologic treatment

If blood pressure remains elevated after 6 to 12 months of lifestyle changes anti hypertensive medications are started. Most patients with hypertension more severe than stage 1 hypertension require drug treatment; however, lifestyle modifications are still a part of therapy even when drug are used. The standard treatment for hypertension includes diuretics and β-blockers, although other drugs (β – angiotensin converting enzyme inhibitors, α – receptor blockers, and calcium antagonists) are equally effective. All these drugs can affect nutrition status.

Diuretics lower blood pressure in some patients by promoting volume depletion and sodium loss; however, thiazide diuretics increase urinary potassium excretion, especially in the presence of a high salt intake, thus leading to potassium loss and possibly hypokalemia. Except in the case of potassium – sparing diuretic such as spironolactone or triamterene, additional potassium is usually required.

1.2.6 Lifestyle Modifications

Lifestyle Modifications are definitive therapy for some and adjunctive therapy for all persons with hypertension. Several months of complaint lifestyle modifications should be tried before drug therapy is initiated. An algorithm for treatment of hypertension, established by the JNC 7 committee (NIH, 2004). Even if lifestyle modifications cannot completely correct the blood pressure, they will help increase the efficacy of pharmacologic agents and improve other CVD risk factors. Management of hypertension requires a lifelong commitment.

1.2.7 Weight reduction

Weight loss is an effective means of lowering blood pressure in hypertensive individuals. For each kilogram weight lost, reductions in SBP and DBP of approximately
1 mm Hg are expected (Neter et al., 2003). Hypertensive patients who weigh more than 115% of ideal body weight should be placed on an individualized weight-reduction program that focuses on both hypo-caloric dietary intake and exercise. Practical suggestions for assisting clients in increasing physical activity and reducing calories include reducing time spent watching television or being online, increasing time spent walking or in activities that raise the heart rate, reducing portion sizes for meals and snacks, reducing the size and frequency of calorie-containing drinks, and limiting fat intake.

In the Diet, Exercise, and weight loss Intervention study, the goal for energy intake to facilitate weight loss was 25 kcal/kg minus approximately 500 kcal daily to produce a 0.4–kg/week (about 1-lb) deficit that would reach a total weight loss of 4.5 kg (Miller et al., 2002). This modest caloric reduction was associated with a significant lowering of SBP and DBP, and low-density lipoprotein cholesterol levels. For the same degree of weight loss, hypo-caloric diets that include a low-sodium DASH dietary pattern have produced more significant blood pressure reductions than low-calorie diets emphasizing only low-fat foods (Nowson et al., 2005).

Another benefit loss on blood pressure is the synergistic effect with drug therapy. In subjects who lost weight and were taking one antihypertensive drug, lowering of blood pressure was greater than in those taking the drug alone (Neter et al., 2003). Therefore weight loss should be an adjunct to drug therapy because it may decrease the dose or number of drugs necessary to control blood pressure.

Once weight is lost, maintenance is critical. Unfortunately relapse and weight gains are common following dieting to lose weight. Some factors associated with effective weight maintenance are exercise, positive self-statements related to weight-reduction efforts, self-monitoring activities (use of a food dairy, goal setting, early attention to weight regain), and problem-solving skills in lieu of eating during stressful times.

1.2.8 Salt restriction

Moderate sodium restriction (2300 mg sodium daily or 6 g of salt) is recommended for treatment of hypertension (NIH, 2004). To achieve nutrient adequacy,
an adequate intake (AI) level of sodium has been set at 1.5 g/day (Institute of medicine, 2004). The DASH – Sodium trial showed that people consuming diets of 1.5 g/day of sodium had greater blood pressure benefits than those with higher intakes (Appel, 1997). Lower – sodium diets were also shown to maintain low blood pressure over time and enhance the efficacy of certain blood pressure – lowering meditations.

1.2.9 Other Dietary Modifications – Minerals

Consuming a diet rich in potassium has been shown to lower blood pressure and blunter effects of salt on blood pressure in some individuals (Appel, 2006). The recommended intake of potassium for adults is 4.7g/day (Institute of Medicine, 2004). Potassium - rich fruits and vegetables include leafy green vegetables, fruits, and root vegetables. Examples of such foods include oranges, beet greens, white beans, spinach, bananas, and sweet potatoes. Increased intakes of calcium and magnesium may have blood pressure benefits.

1.2.10 Alcohol

The diet history should contain information about alcohol consumption. Alcohol intake should be limited to no more than 2 drinks daily in men, which is equivalent to 2 oz of 100 – proof of whiskey, 10 oz of wine, or 24 oz of beer. Women or lighter – weight men should consume half this amount.

1.2.11 DASH Diet

The DASH diet is an eating pattern that reduces high blood pressure. It is not the traditional low – salt diet. DASH uses foods high in the minerals calcium, potassium, and magnesium, which when combined helps lower blood pressure. It is also low in fat and high in fiber, an eating style recommended for everyone.

The healthy Eating Pattern in the template for the DASH eating pattern, with inclusion of ½ to 1 serving of nuts, seeds, and legumes daily, limited fats and oils, and use of non fat or low – fat milk. The eating pattern is reduced in saturated fat, total fat, cholesterol, and sweet and sugar containing beverages and provides abundant servings of fruits and vegetables.
Although the DASH eating plan is naturally lower in salt because of the emphasis on fruits and vegetables, all adults should still make an effort to reduce packaged and processed foods and high-sodium snacks (such as salted chips, pretzels, and crackers) and use less or no salt at the table. DASH can be an excellent way to lose weight. Because weight loss can help lower blood pressure, it is often suggested. In addition to following DASH, try adding in daily physical activity such as walking and other exercise.

Table 1.2. The Dash Diet

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Grains (whole grains)</td>
<td>6</td>
<td>7 – 8</td>
<td>10 -11</td>
<td>12 - 13</td>
</tr>
<tr>
<td>Vegetables</td>
<td>3 – 4</td>
<td>4 – 5</td>
<td>5 – 6</td>
<td>6</td>
</tr>
<tr>
<td>Fruits and juices</td>
<td>4</td>
<td>4 – 5</td>
<td>5 – 6</td>
<td>6</td>
</tr>
<tr>
<td>Milk, nonfat or low fat</td>
<td>2 -3</td>
<td>2 -3</td>
<td>3</td>
<td>3 -4</td>
</tr>
<tr>
<td>Meats, poultry &amp; fish</td>
<td>1 -2</td>
<td>2 or less</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>Nuts, seeds &amp; legumes</td>
<td>3 / week</td>
<td>½ - 1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Fats and oils</td>
<td>2</td>
<td>2 – 3</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Sweets</td>
<td>0</td>
<td>5/week</td>
<td>Less than 2</td>
<td>2</td>
</tr>
</tbody>
</table>

1.2.12 Hypertensive Cardiovascular Disease

The diseases of the heart and the circulation caused by hypertension are called hypertensive cardiovascular disease. Heart disease can be detected with the electrocardiogram and the echocardiogram. When the electrocardiogram and / or the echocardiogram shows evidence of thickening of the heart muscle (left ventricular hypertrophy) it is an indication that the risk for heart disease is high. Effective antihypertensive therapy can improve and even reverse the condition.

1.2.13 Hypertensive Cerebrovascular Disease

The diseases of the brain circulation caused by hypertension are called Hypertensive Cerebrovascular Disease. Systolic hypertension is the most important cause
of stroke and dementia caused by strokes. There is also evidence that Alzheimer’s dementia is also more common in individuals with hypertension.

1.2.14 Hypertensive Renal Disease

The disease of the kidney caused by hypertension is called hypertensive renal disease. It is more common in blacks. Hypertension and diabetes result in kidney disease and once present will contribute to the worsening of hypertension. The progression of this process makes it imperative that diabetics and/or persons with kidney disease who also suffer from hypertension be evaluated and treated earlier than other persons without those conditions.

1.2.15 Peripheral Vascular Disease and Coronary Artery Disease

Hypertension causes hardening of the arteries - a condition called atherosclerosis. Heredity, diabetes, high cholesterol levels and cigarette smoking also play a role in causing atherosclerosis. Because atherosclerosis is caused by several factors, treating hypertension will not necessarily result in the prevention of atherosclerosis. However, the treatment of hypertension will decrease the likelihood of coronary artery disease, aortic aneurysm and other diseases caused by atherosclerosis.

1.3 Physical Exercise

Physical exercise is an organized activity that involves continuous participation. Exercise occupies a leading role in keeping a person fit. It will be quite difficult to adjust one’s life in terms of stress, diet and sleep and so on without proper exercise.

Physical exercises are helpful to maintain an organically sound body to enjoy an optimum state of health and physical fitness. Achieving and maintaining physical exercise helps to prevent the premature occurrence numerous illness and diseases. The purpose of exercise is to increase the circulation of blood intake of oxygen, improve the strength, endurance and functioning of heart, lungs and muscles. It helps mental alertness, stress, reducing emotional stability and spiritual and moral development. Many researchers strongly support that regular exercise helps one to keep a strong and healthy heart and to prevent cardiovascular diseases (Kamalesh, 1988).
According to Robert (1989), “lack of activity destroys the good condition of every human being while movement and methodical physical exercise save it and preserve it”. And he states that exercise means using and toning the body. Exercise builds and maintains physical fitness. Physical exercise is referred to as physical activity ranging from light to fairly vigorous and regular exercise, which produces increased strength and endurance and reduced cholesterol and such other characteristics associated with good health.

All exercises are to be considered specific. It is highly necessary that exercise be used in order to develop not only the part of the body but also the quality of the body. Therefore, it is highly important to use specific exercises for specific purposes. So, the regular exercise helps to prevent cholesterol which is related to coronary heart diseases, obesity, hypertension and diabetes.

1.3.1 Walking

Walking as a moderate exercise has been proved to reduce health risks and prolong life. It is the aerobic benefits of fitness, which really provide the long-term health benefits. Walking aerobically causes the body to take in more air with less effort. The lungs are able to extract more oxygen from the increased supply and deliver it to the cells, where it is needed to combine with food to produce energy. The result is an improvement in vital efficiency of the lungs and whole cardiovascular system. Blood flow to the muscles is increased. Muscles and ligaments are strengthened. Joints became more mobile and stronger. Walking is one of the best forms of relaxation.

Walking is the simplest (for observing) and probably most efficient (mechanically) form of movement in which the human being may engage. In walking the position of the body is similar to that of standing, except that the centre of gravity is moved.

Walking is a fundamental locomotive skill in different activities of life. Walking results from successive loss of balance of the two alternating feet.

The following combination of three forces results in forward progress in walking.

1. Muscular force causing pressure of the foot against the surface
2. Force of gravity which tends to pull the body downward
3. Force of momentum which extends to keep the body moving in the same direction and at constant speed.
The act of walking is a matter of disturbing the mechanical equilibrium of the body. Pushing the body forward and forming successive new bases by moving the legs forward alternatively. Walking is a reflex action because no conscious control is necessary. Walking is a translatory motion of the body parts. Walking is a periodic or pendulum movement in which there is a zero point of motion and fall to zero at the end of each stroke.

1.3.2 Importance of walking for the development of good health

If jogging, swimming, cycling, aerobic dancing and other strenuous activities aren’t for you, try walking. Regular walking contributes many of the heart benefits of other activities. And walking has advantages that, we can use any appropriate shoes, no special clothing or equipments is required and walking can be fit easily into daily schedule. Walking contributes the most to health when it is done regularly (about four times a week) for about an hour. How strenuous the walk should be depends on the desires and physical abilities of the walker. Most of the benefits can be derived by walking between two and four miles per hour. Aerobic capacity can be increased by walking briskly enough to increase the heart rate.

A daily walking program exercises improves many muscles in the body, including the heart. Walking also improves blood circulation and helps, blood deliver oxygen to the lungs and tissues more efficiently. In time, to improve the overall conditioning and endurance level and the muscle fibers will grow shorter and become more efficient. This efficiency will require less oxygen to power the muscles and giving more energy for other activities.

1.3.3 Walking as a form of physical exercise

Walking is suggested as a good exercise. While a person walks, he can observe himself. He can notice the heel-to-toe foot placement. His toes should point directly forward with each step with the inner border of his feet falling approximately along a straight line. He can feel how relaxed his upper body is. He will have a natural arm swing that starts at the shoulder joint. His wrist breaks naturally, and his fingers are slightly curled. On each step, his left arm will move forward as his right leg moves forward and vice versa.
Running and walking are basically similar in terms of techniques. The difference is that in walking there is a time when both feet are on the ground at the same time; while in running there is a period of flight (both feet are off the ground at the same time). The energy consumption for aerobic running is about twice that value, regardless of speed.

Fitness walking is brisk, but aerobic walking has a low impact, low – stress form of exercise. It is not “power walking”, where walkers are pounding the pavements at more than 5 miles an hour. (This is not a moderate form of exercise, it could just an easily be called stress walking) and it is not race walking, where walkers swing their arms vigorously backward and forward as they strides along at 8-9 miles an hour. It is however brisk, aerobic walking which increases the rate at which one’s heart and lungs works so that he gains all the short and long term benefits of aerobic exercise without the risk to his hips, knees, and ankles, inherent in high impact work-outs like jogging and aerobics.

Fitness walking is a good exercise recommended by exercise physiologists, biomechanical experts, cardiologists, chest experts, obesity experts and stress experts among others. Walking has always been a major form of transportation for man, but only recently have the health and mental benefits of fitness walking become apparent.

1.3.4 Make walking a pleasure

To make regular walking a pleasurable form of physical activity, wear loose and comfortable clothing. Protect yourself from the sun with clothes, sunglasses, a hat and sun block. Wear waterproof clothing to avoid getting wet if it rains. Drink plenty of fluids before and after your walk. If you are taking a long walk, take water with you. Vary your walking routes so you can enjoy the change in scenery. Walk with a friend and combine physical activity with socializing. Join a local walking club.

1.3.5 Types of Walking

a) Rambling

Walking in the countryside, often in groups, over a set route. Such routes may use footpaths, bridleways, way marked paths, national trails, common land and national parks.
b) Hill and fell walking

Walking up hills increases the work load and energy cost considerably; even walking down again uses more energy than walking on the flat. Walking downhill can also make you sore if you are unaccustomed to it, as it uses muscles as shock absorbers.

c) Fitness and power walking

The idea is to walk at such a fast pace that it would actually be easier to break into a run. You actually burn more calories walking at this speed than you would running at the same pace.

d) Race Walking

This can be highly competitive or sociable and friendly. At one end of the scale are highly tuned Olympic athletes; at the other are fun race walkers, often to be found holding their own in the middle of a field of fun runners.

1.3.6 Tips of walking

Make exercise a regular part of your life. Exercise and walking are excellent tools of controlling hypertension and type II diabetes. Morning walking is recommended best time for walking is 1-2 hours after a meal, when your insulin and blood sugar levels have settled down. Drink up to prevent dehydration, have a big glass of water an hour before walking. Then drink a cup of water every 20 minutes of walking. After walking, you may need to eat more carbohydrates than usual to prevent delayed hypoglycemia. When walking, aware of your body and how you are feeling. Walking with somebody else keeps you more regular in your exercise.

1.3.7 Benefits of walking

You carry your own body weight when you walk. This is sometimes called 'weight bearing' exercise. Increased cardiovascular and pulmonary (heart and lung) fitness. Improved management of conditions such as hypertension (high blood pressure), high cholesterol, joint and muscular pain or stiffness, and diabetes. Improve blood circulation and helps the blood deliver oxygen to the lungs and tissues more efficiently. Stronger bones, increase bone density, hence helping in preventing osteoporosis.
Increased muscle strength and endurance, reduce body fat, reduce the risk of coronary heart disease and stroke, lower blood pressure, reduce high cholesterol, improve blood lipid profile. Reduces the risk of cancer of the colon, reduces the risk of non insulin dependent diabetes, enhances mental well being, helps to improve flexibility and coordination hence improve body balance. Helps to control body weight and helps in preventing osteoarthritis, helps to control body weight. Good exercise for People with osteoarthritis.

1.4 Yoga

The word Yoga is derived from the Sanskrit root Yuj meaning to bind, join, attach and yoke, to direct and concentrate one’s attention on, and to use and apply. It means union or communion. It is the true union of our will with the will of God. ‘It thus means,’ says Mahadev Desai in his introduction to the *Gita according to Gandhi*, ‘the yoking of all the powers of body, mind and soul and God; it means the disciplining of the intellect, the mind, the emotions, the will, which that Yoga presupposes; it means a poise of the soul which enables one to look at life in all its aspects evenly’ (Iyengar, 2008a).

1.4.1 The stages of yoga

Patanjali enumerates these means as the eight limbs or stages of Yoga for the quest of the soul. They are,

Yama (Universal moral commandments); 2. Niyama (self purification by discipline); 3. Asana (Posture); 4. Pranayama (rhythmic control of the Breath); 5. Pratyahara (Withdrawal and emancipation of the mind from the domination of the senses and exterior objects); 6. Dharana (Concentration); 7. Dhyana (meditation) and 8. Samadhi (a state of super – consciousness brought by profound meditation, in which the individual aspirant (sadhaka) becomes one with the object of his meditation – Paramatma or the Universal Spirit).

Yama and Niyama control the yogi’s passions and emotions and keep him in harmony with his fellow man. Asanas keep the body healthy and strong and in harmony with nature. Finally, the yogi becomes free of body consciousness. He conquers the body and renders it a fit vehicle for the soul. The first three stages are the outward quests (bahiranga sadhana).
The next two stages, Pranayama and Pratyahara, reach the aspirant to regulate the breathing, and thereby control the mind. This helps to free the senses from the thraldom of the objects of the desire. These two stages of yoga are known as the inner quests (antaranga sadhana).

Dharana, Dhyana and Samadhi take the yogi into the innermost recesses of his soul. The yogi does not look heavenward to find god. He knows that he is within, being known as the Antaratma (the Inner Self). The last three stages keep him in harmony with himself and his Maker. These stages are called antaratma sadhana, the quest of the soul (Iyengar, 2008b).

1.4.1.1. Asana

The third limb of yoga is asana or posture. Asana brings steadiness, health and lightness of limb. A steady and pleasant posture produces mental equilibrium and prevents fickleness of mind. Asanas are not merely gymnastic exercises; they are postures. To perform them one needs a clean airy place, a blanket and determination, while for other systems of physical training one needs large playing fields and costly equipment. Asanas can be done alone, as the limbs of the body provide the necessary weights and counter – weights. By practicing them one develops agility, balance, endurance and great vitality.

Asanas have been evolved over the centuries so as to exercise every muscle, nerve and gland in the body. They secure a fine physique, which is strong and elastic without being muscle – bound and they keep the body free from disease. They reduce fatigue and soothe the nerves. But their real importance lies in the way they train and discipline the mind.

Many actors, acrobats, athletes, dancers, musicians and sports men also possess superb physiques and have great control over the body, but they lack control over the mind, the intellect and the self. Hence they are in disharmony with themselves and one rarely comes across a balanced personality among them. They often put the body above all else. Though the yogi does not underrate his body, he does not think merely of its perfection but of his senses, mind, intellect and soul. The yogi conquers the body by the practice of asanas and makes it a fit vehicle for the spirit. He knows that it is a necessary vehicle for the spirit. A soul without a body is like a bird deprived of its power to fly.
By performing asanas, the sadhaka first gains health, which is not mere existence. It is not a commodity which can be purchased with money. It is an asset to be gained by sheer hard work. It is a state of physical and mental consciousness is health. The yogi frees himself from physical disabilities and mental distractions by practicing asanas. He surrenders his actions and their fruits to the lord in the service of the world.

1.4.1.2. Pranayama

‘Prana’ means breath, respiration, life, vitality, energy or strength. When used in the plural, it denotes certain vital breaths or currents of energy (prana-vayus). ‘ayama’ means stretch, extension, expansion, length, breadth, regulation, prolongation, restraint or control. ‘Pranayama’ thus means the prolongation of breath and its restraint. The Siva Samhita calls it vayu sadhana (vayu – breath; sadhana – practice, quest). Patanjali in his Yoga Sutras describes pranayama as the controlled intake and outflow of breath in a firmly established posture.

Pranayama is an art and has techniques to make the respiratory organs to move and expand intentionally, rhythmically and intensively. It consists of long, sustained subtle flow of inhalation (puraka), exhalation (rechaka) and retention of breath (kumbhaka). Puraka stimulates the system; rechaka throws out vitiated air and toxins; kumbhaka distributes the energy throughout the body. The movements include horizontal expansion (darighya), vertical ascension (aroha) and circumferential extension (visalata) of the lungs and the rib cage.

Pranayama is not just automatic habitual breathing to keep body and soul together. Through the abundant intake of oxygen by its disciplined techniques, subtle chemical changes take place in the sadhaka’s body. The practice of asanas removes the obstructions which impede the flow of prana, and the practice of pranayama regulates that flow of prana throughout the body. It also regulates all the sadhaka’s thoughts, desires and actions, gives poise and the tremendous will – power needed to become a master of oneself.

During normal inhalation, an average person takes in about 500 cubic centimeters of air; during deep inhalation the intake of air is about six times as great, amounting to
almost 3000 cubic centimeters. The capacities of individuals vary according to their constitution. The practice of pranayama increases the sadhaka’s lung capacity and allows the lungs to achieve optimum ventilation. When the breath is irregular, the mind wavers; when the breath is steady, so is the mind. To attain steadiness, the yogi should restrain his breath. As long as there is breath within the body, there is life. When breath departs, life also departs. Therefore, regulate the breath.

The practice of pranayama helps to cleanse the nadis, which are tubular organs of the subtle body through which energy flows. There are several thousand nadis in the body and most of them start from the areas of the heart and the navel. Pranayama keeps the nadis in a healthy condition and prevents their decay. This in turn brings about changes in the mental attitude of the sadhaka. The reason for this is that in pranayama breathing starts from the base of the diaphragm on either side of the body near the pelvic girdle. As such, the thoracic diaphragm and the accessory respiratory muscles of the neck are relaxed. This in turn helps to relax the facial muscles relax, they loosen their grip over the organs of perception, namely, the eyes, ears, nose, tongue and skin, thereby lessening the tension in the brain. When tension there is lessened, the sadhaka attains concentration, equanimity and serenity.

1.4.2 Savasana

Sava or Mrta means a corpse. In this asana the object is to imitate a corpse. Once life has departed, the body remains still and no movements are possible. By remaining motionless for some time and keeping the mind still while you are fully conscious, you learn to relax. This conscious relaxation invigorates and refreshes both body and mind. But it is much harder to keep the mind than the body still. Therefore, this apparently easy posture is one of the most difficult to master.

1.5 Physical variables

1.5.1 Grip strength

Muscular strength is defined as the maximum amount of force a muscle or muscle group can exert in a single effort. The strength is not only a product of the muscle but also of the nervous system which controls and regulates the muscular constructions. The dynamometer is used to measure the strength of the legs, back, hand grip and arms grip strength.
1.5.2 Flexibility

Flexibility is the ability to move a joint smoothly through its complete range of motion. There are two main types’ namely static flexibility and dynamic flexibility. Static flexibility is the ability to move slowly into a stretched position and to hold the body still (e.g. the ability to sit in a splits position). Dynamic flexibility is the ability to move quickly or at normal speed into a stretched position (e.g. a gymnast performing a split leap).

Flexibility is one of the main components of physical fitness and is believed to be important for optimum health. Flexibility exercises have been prescribed for the relief of menstrual disorders, general neuromuscular tension, and low back pain. A certain amount of flexibility is needed for body movement; conversely, lack of flexibility restricts movement. Flexibility of a particular joint is limited by factors such as the bony structures of joints, and the size, strength and extensibility of the muscles, ligaments, and tissues associated with the joint. Most flexibility exercises focus on improving the extensibility of muscles and associated tissues, usually by static or very slow stretching.

1.5.3 Body Mass Index (BMI)

Body mass index or BMI is a tool for indicating weight status in adults. It is a measure of weight for height. For adults over 20 years old, BMI falls into one of these categories (Garrow and Webster, 1985).

<table>
<thead>
<tr>
<th>BMI</th>
<th>Weight status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below 18.5</td>
<td>Underweight</td>
</tr>
<tr>
<td>18.5 – 24.9</td>
<td>Normal</td>
</tr>
<tr>
<td>25.0 – 29.9</td>
<td>Overweight</td>
</tr>
<tr>
<td>30.0 and above</td>
<td>Obese</td>
</tr>
</tbody>
</table>

Suggested BMI ranges are as follows

<table>
<thead>
<tr>
<th>Age</th>
<th>BMI</th>
</tr>
</thead>
<tbody>
<tr>
<td>19 -24</td>
<td>19 – 24</td>
</tr>
<tr>
<td>25 – 34</td>
<td>20 – 25</td>
</tr>
<tr>
<td>35 – 44</td>
<td>21 – 26</td>
</tr>
<tr>
<td>45 – 54</td>
<td>22 – 27</td>
</tr>
<tr>
<td>55 – 64</td>
<td>23 – 28</td>
</tr>
<tr>
<td>65 – 77</td>
<td>24 – 29</td>
</tr>
</tbody>
</table>
BMI correlates with body fat. It is maximally correlated with weight and minimally correlated with height. The relation between fatness and BMI differs with age and gender. (Gallagher D,) explains that women are more likely to have a higher percent of body fat than men for the same BMI. On average, older people may have more body fat than younger adults with the same BMI.

World Health Organization (WHO, 1995) states that the BMI ranges are basic for body weight, disease and death. As BMI increases, the risk for some disease increases. BMI can be calculated using feet, inches and pounds, or meters, centimeters and kilograms.

**English Formula**

Body Mass Index can be calculated using pounds and inches with this equation

\[
BMI = \frac{\text{Weight in pounds}}{\text{(Height in inches)} \times \text{(Height in inches)}} \times 703
\]

**Metric Formula**

Body mass index can also be calculated using kilograms and meters (or centimeters).

\[
BMI = \frac{\text{Weight in kilograms}}{\text{(Height in meters)} \times \text{(Height in meters)}}
\]

\[
BMI = \frac{\text{Weight in kilograms}}{\text{(Height in centimeters)} \times \text{(Height in centimeters)}} \times 10000
\]

**1.6 Physiological variables**

**1.6.1 Percent body fat**

A person's body fat percentage is the total weight of the person's fat divided by the person's weight and consists of essential body fat and storage body fat. Essential body fat is necessary to maintain life and reproductive functions. The percentage of essential
Body fat for women is greater than that for men, due to the demands of childbearing and other hormonal functions. The percentage of essential fat is 3%–5% in men, and 8–12% in women. Storage body fat consists of fat accumulation in adipose tissue, part of which protects internal organs in the chest and abdomen. The minimum recommended total body fat percentage exceeds the essential fat percentage value reported above. A number of online tools are available for calculating estimated body fat percentage.

Some regard the body fat percentage as the best measure of an individual's fitness level since it is the only body measurement which directly calculates the particular individual's body composition without regard to the individual's height or weight. The widely used body mass index (BMI) provides a measure that allows for the comparison of individuals of different heights in terms of their weight. Due to differences in body composition, the BMI is not necessarily an accurate indicator of body fat; for example, individuals with greater muscle mass will have higher BMIs. The thresholds between "normal" and "overweight" and between "overweight" and "obese" are sometimes disputed for this reason.

<table>
<thead>
<tr>
<th>Description</th>
<th>Women</th>
<th>Men</th>
</tr>
</thead>
<tbody>
<tr>
<td>Essential fat</td>
<td>8–12%</td>
<td>3–5%</td>
</tr>
<tr>
<td>Athletes</td>
<td>14-20%</td>
<td>6–13%</td>
</tr>
<tr>
<td>Fitness</td>
<td>21-24%</td>
<td>14–17%</td>
</tr>
<tr>
<td>&quot;Average&quot;</td>
<td>25-32%</td>
<td>18-24%</td>
</tr>
<tr>
<td>Excess fat</td>
<td>32%+</td>
<td>25%+</td>
</tr>
</tbody>
</table>

1.6.2 Resting heart rate

The number of beats felt in exactly one minute in resting condition is called resting heart rate.

Ruderman et al. (2002) states that heart rate is the primary guide for aerobic exercise intensity, whereas the target heart rate for exercise is typically set at 60 -90% of the maximum heart rate for healthy adults, patients with diabetes having the risk of cardiovascular disease and poor level of fitness should aim instead for a target heart rate corresponding to 55 – 75% of maximum and increased as tolerated. A lower heart rate
range is necessary for patients with autonomic neuropathy and heart disease. It is preferred that the maximal heart rate be obtained from exercise testing or the formula of maximum heart rate = 220-age (beats/min).

Heart rate is the number of heartbeats per unit of time, typically expressed as beats per minute (b.p.m). Heart rate can vary as the body's need to absorb oxygen and excrete carbon dioxide changes, such as during exercise or sleep. The measurement of heart rate is used by medical professionals to assist in the diagnosis and tracking of medical conditions. It is also used by individuals, such as athletes, who are interested in monitoring their heart rate to gain maximum efficiency from their training. The R wave to R wave interval (RR interval) is the inverse of the heart rate.

The resting heart rate is a person's heart rate when they are at rest, that is lying down but awake, and not having recently exerted themselves. The typical resting heart rate in adults is 60-80 b.p.m, with rates below 60 b.p.m referred to as bradycardia, and rates above 100 b.p.m referred to as tachycardia. Conditioned athletes often have resting heart rates below 60 b.p.m, with values of below 40 b.p.m not unheard of. For instance, cyclist Lance Armstrong has been known to have resting heart rates to as low as around 32 b.p.m; cyclist Miguel Indurain had a resting heart rate of 28 b.p.m. The low pulse in conditioned athletes is due to the reduced demand on the heart by the peripheral muscles due to their greater efficiency. Hypertrophy, which is enlargement and thickening of cardiac muscle tissue can also account for a lower heart rate, therefore enabling a higher volume of blood being pumped at each beat.

1.6.3 Resting blood pressure

Johnson Sinacore and Angela define “Blood pressure is the force exerted by blood against the walls of the vessels”. This force or pressure is measured by a sphygmomanometer and it consists of two readings. The high reading is systolic pressure recorded during the heart’s pumping stroke. The lower reading is the diastolic pressure recorded when the heart is relaxed and refilling between beats. Blood pressure reading varies with individuals and the physician considers all factors before labeling a recording is normal or high.
Blood pressure (BP) is the pressure exerted by circulating blood upon the walls of blood vessels, and is one of the principal vital signs. When used without further specification, "blood pressure" usually refers to the arterial pressure of the systemic circulation. During each heartbeat, blood pressure varies between a maximum (systolic) and a minimum (diastolic) pressure. The blood pressure in the circulation is principally due to the pumping action of the heart. Differences in mean blood pressure are responsible for blood flow from one location to another in the circulation. The rate of mean blood flow depends on the resistance to flow presented by the blood vessels. Mean blood pressure decreases as the circulating blood moves away from the heart through arteries, capillaries and veins due to viscous losses of energy. Mean blood pressure drops over the whole circulation, although most of the fall occurs along the small arteries and arterioles (Klabunde and Richard, 2005). Gravity affects blood pressure via hydrostatic forces (e.g. during standing) and valves in veins, breathing, and pumping from contraction of skeletal muscles also influence blood pressure in veins.

The measurement blood pressure without further specification usually refers to the systemic arterial pressure measured at a person's upper arm and is a measure of the pressure in the brachial artery, major artery in the upper arm. A person's blood pressure is usually expressed in terms of the systolic pressure over diastolic pressure and in measured in millimetres of mercury (mmHg), for example 140/90.

1.6.4 Cardiovascular endurance

Cardio means heart, vascular means function of tissue and endurance means capacity. Cardiovascular endurance refers to the ability of the circulatory system to provide oxygen to the cells to support the oxidative energy schemes of the body and to remove the waste products of metabolism. When many muscles are worked for long period of time, these factors limit the amount of work which can be accomplished. Therefore, the primary objective of cardiovascular training is to improve the circulation to the working muscle and do the physical work at constantly high rate without onset of fatigue (Fox and Mathews, 1981).
Cardiovascular endurance training can be divided into two main categories as aerobic and anaerobic training. Aerobic training involves training to all the systems, which supply oxygen to the cells of the body, whereas anaerobic training involves energy mechanisms, which supply energy without the presence of oxygen. It is measured by Coopers 12 min run/walk test method.

1.7 Biochemical variables

1.7.1 Total Cholesterol

Cholesterol is a blood fat needed by the body in moderate amounts. This type of fat is produced by the liver and found in the blood; it is also found in some foods. Cholesterol is used by the body to make hormones and build cell walls. If excessive deposited of inside arteries produce arteriosclerosis and heart diseases.

It is a soft, waxy substance found among the lipids (fats) in the blood stream and in all our body’s cells. It builds and repairs cells and it is used for producing sex hormones such as estrogen and testosterone and it is converted to bile acids to help digest food, manufacture vitamin D on the skin’s surface. It is found in large amounts in brain and nerve tissue. A variable quantity of dietary cholesterol contributes to the total concentration in humans. Its importance relates to its role in the stabilization of membrane structures because of its rigid planer structure. Approximately 410 g of cholesterol is present in humans, of which 85 % is associated with cell membranes. It also serves as a precursor for the synthesis of steroid hormones.

Normal range

Low risk: < 160 mgs%

Border line risk: 160 – 200 mgs%

High risk: > 200

1.7.2 HDL (High Density Lipoprotein) Cholesterol

It is the good cholesterol because high concentrating in the blood are associated with a low risk of heart attack. HDL contains more protein than triglycerides or cholesterol and it helps to remove cholesterol from artery walls. HDL carries cholesterol
from body cells to the liver, either be reused, converted to bile acids or disposed in the bile. A high HDL level (above 45 mg/dL) appears to protect arteries from dangerous narrowing and thus helps to prevent heart attacks. Level below 35 mg /dL is strongly predictive of Coronary Artery Disease (CAD) and its complications.

Normal range
Low risk: > 45 mgs %
Border line risk: 35 – 45 mgs %
High risk: < 35 mgs %

1.7.3 LDL (Low density Lipoprotein) cholesterol

It is the “bad” cholesterol that is associated with a higher risk of heart disease. LDL becomes oxidized and gets deposited in the walls of arteries to initiate the condition known as “atherosclerosis” or hardening of the arteries.

The result of the lipid profile is considered along with other known risk factors of heart disease to develop a plan of treatment and follow – ups. Periodical lipid profile data will help the physician to advice the patient to modify his eating and living habits, increase or decrease dosage of medicine and duration of activity.

Normal range
Low risk: < 100mgs %
Border line risk: 100 - 130 mgs %
High risk: > 130 mgs %

HDL and LDL cholesterol have been found to play an important role in the occurrence of heart disease. LDL transports cholesterol from the liner to various tissues for use and it in the form fat liked to the inner lining of blood vessels. HDL’s transport excess cholesterol from the tissues banks to the liver and have been found to prevent the fatty plaques from doing deposited on the vessel living. Research has demonstrated that physically fit individuals tend to have greater amount of HDL and lower amount of LDL in the prevention of heart disease and hypertension.
Mason and Christine (2005) reported that in most people, 60 to 70 percent of cholesterol is carried in LDL particles. LDL particles acts as ferries, taking cholesterol to the parts of the body that need it at any given time. Unfortunately, if you have too much LDLs in the bloodstream, it deposits the cholesterol into the arteries, which can cause blockages and lead to heart attacks. That’s why people refer to LDL as the ‘bad’ cholesterol. The good news is that the amount of saturated fat and cholesterol you eat. So, most people can decrease their LDL if they follow a reduced – fat diet. When you get fasting cholesterol test, your doctor should test for the level of LDL cholesterol.

1.8 STATEMENT OF THE PROBLEM

The purpose of the study was to find out the effects of physical exercise and yoga on selected physical, physiological and biochemical variables of hypertensive patients.

1.9 OBJECTIVES OF THE STUDY

The main objective of the study were

1. To find out the effect of physical exercise on selected physical variables of grip strength, flexibility and BMI, physiological variables of percent body fat, resting heart rate, resting systolic blood pressure, resting diastolic blood pressure and cardiovascular endurance, and biochemical variables of total cholesterol, high density lipo protein and low density lipo protein of hypertensive patients.

2. To find out the effect of yoga on selected physical variables of grip strength, flexibility and BMI, physiological variables of percent body fat, resting heart rate, resting systolic blood pressure, resting diastolic blood pressure and cardiovascular endurance, and biochemical variables of total cholesterol, high density lipo protein and low density lipo protein of hypertensive patients.

3. To compare the effect of physical exercise and yoga on selected physical, physiological and biochemical variables of hypertensive patients.

1.10 HYPOTHESIS

It was hypothesized that the practice of physical exercise and yogic exercise may produce significant changes in selected physical, physiological and biochemical variables of hypertensive patients.
1.11 SIGNIFICANCE OF THE STUDY

The present investigation is supposed to have the following significant contribution to the field of physical education and sports.

1. The research would add to the quantum of knowledge in the area of the yogic and exercise physiology.
2. The research results permit us to draw satisfactory conclusions regarding physical, physiological and bio-chemical parameters.
3. The research would be of great importance, if it proves to be beneficial. And it would provide opportunities for the common man to design new training programmes.
4. The research would reveal that extend to which the yogic and physical training would influence beneficial effects on the selected variables, in the light which that necessary attention can be given to those variables.
5. The result of the study may be helpful to the hypertensive patients (persons) to understand the status of health.
6. The research would also help us to compare the change that occurs in the variables before and after performing the physical exercise and yogic training.
7. The research may be useful to the physical educationist to conduct the future research in this area.

1.12 LIMITATIONS

1. Certain factors such as life style, rest period, day to day activities, family factors and intake of medicine were not taking into consideration.
2. Socio-economic background was not taken into consideration.
3. No attempt was made to control the factors such as air resistance, intensity of light, atmosphere and temperature during the training period.
4. The subject’s previous experience in physical activities and yogic exercise were not taken into consideration.
1.13 DELIMITATIONS

The study was restricted to stage 1 Hypertension only.
1. The study was conducted on middle aged male hypertensive persons in erode.
2. The duration of the training programme was confined to 12 weeks.
3. The study confined to 90 hypertensive persons who were selected at random basis from Surampatty area in the Erode district. The 90 hypertensive persons were divided into three groups namely physical exercise group (group I, N = 30) yogic exercise group (group II, N = 30) and control group (group III, N = 30).
4. The variables were delimited to physical variables such as grip strength, flexibility and body mass index, physiological variables such as percent body fat, resting heart rate, resting systolic blood pressure, resting diastolic blood pressure, cardiovascular endurance and biochemical variables such as total cholesterol, high density lipo protein and low density lipo protein.

1.14 DEFINITION OF THE TERMS

1.14.1 Fitness

Barrow states that “Fitness include the mental, emotional, social as well as the physical aspects and all these components of total fitness play a significant role for a full and happy life”.

1.14.2 Physical fitness

Physical fitness is “the capacity of the heart, blood vessels, lungs and muscles to function at optimal efficiency” (Bud and Getchell, 1976).

1.14.3 Health

According to world health organization, health refers to such qualities as physical, mental, emotional and social health. It is not limited to the mere absence disease and infirmity, it means total fitness. Today the emphasis in the health care field is a wellness rather than sickness and on preventive medicine rather than remediation.

1.14.4 Health related fitness

Health related fitness concerns with the development of qualities necessary to function efficiently and maintain a healthy life style; cardio respiratory endurance,
muscular strength, flexibility and body composition contribute the components of health related fitness (Bill, 1987).

1.14.5 Hypertension

Hypertension is defined as a systolic blood pressure consistently above 140 mm Hg and a diastolic blood pressure consistently above 90 mm Hg. The incidence of hypertension increases with age. It is more common in blacks than in whites. About 45 million Americans suffer from hypertension and only 25 % of them are controlling their dangerously high pressure. Even mild hypertension should be treated.

1.14.6 Stage 1 Hypertension

Stage 1 hypertension is defined as systolic blood pressure consistently -140 to 159 mm Hg / diastolic blood pressure consistently-90 to 99 mm Hg.

1.14.7 Physical exercise

Adolphe defines “Exercise is any bodily exertion for the sake of keeping the organs and their functions in a healthy state”.

1.14.8 Brisk walking

Walking results from successive loss of balance of the two alternating feet, it is reflex action. As a person walk faster, this period of double support becomes smaller and smallest fraction of the walking cycle is called brisk walking. The length and frequencies of the stride is increased in this brisk walking.

1.14.9 Yoga

The word Yoga is derived from the Sanskrit root Yuj meaning to bind, join, attach and yoke, to direct and concentrate one’s attention on, and to use and apply. It means union or communion. It is the true union of our will with the will of God (Iyenkar.B.K.S, 2008 b)

1.14.10 Asana (Postures)

Asana means holding the body a particular posture to bring stability to the body and the poise to the mind. The practice of asana brings purity in tubular channels, firmness to the body and vitality to the body and the mind (Sharma.P.D, 1997).
1.14.11 Pranayama (Breath control)

The literal meaning of Pranayama is Breath control. The aim of practicing Pranayama is to stimulate, regulate and harmonize vital energy of the body. Just as a bath is required for purifying the body, so also pranayama is required for purifying the mind (Sharma.P.D, 1997).

1.14.12 Dhyana (Meditation)

When one sustains and maintains the focus of attention through Dharana unbound by time and space, it becomes Dhyana (Meditation). Deep concentration destroys the Rajas and Tamas Gunas of mind and develops the satvika Gunas (qualities).

1.14.13 Strength

Strength is the force that a muscle or muscle group can exert against resistance in one maximal effort (Gothi, 1993).

1.14.14 Flexibility

Flexibility refers to the ability of joints to move through a full range of motion.

1.14.15 Body mass index (BMI)

It is a measure used for evaluating body weight relative to a person’s height i.e. weight in kg / (height in m). BMI is used to find out if a person is underweight, normal weight, over weight or obese.

Height

Height is the vertical measurement from sole of foot to vertex. Unit is in meter.

Weight

Weight is the measurement of total body mass. Unit is in Kilograms.

1.14.16 Percent Body Fat

The amount of body fat a soldier has in comparison to his total body mass.
1.14.17 Heart rate

Heart rate or pulse rate is the rate of beats of the heart per minute (Morehouse and Miller, 1976).

1.14.18 Resting Heart Rate (RHR)

The resting heart beat or heart frequency is defined as the frequency of heart beats in one minute, when a person is in resting condition (Guyton, 1962).

1.14.19 Blood pressure

Blood pressure is the lateral pressure exerted by the blood on the vessel walls flowing though it (Chatterjee, 1980).

1.14.20 Systolic blood pressure

It is defined as the blood pressure when the heart is contracting. It is specifically the maximum arterial pressure during contraction of the left ventricle of the heart. The time at which ventricular contraction occurs is called systole (Webmd 2001).

1.14.21 Diastolic blood pressure

Diastolic pressure is defined as specifically the minimum arterial pressure during as specifically the minimum arterial pressure during relaxation (diastole) and dilatation of the ventricles of the heart when the ventricles fill with blood (Webmd 2001).

1.14.22 Cardio vascular Endurance

Cardio vascular endurance is defined as the ability to continue or persist in strenuous task involving large muscle group for longer period of time.

1.14.23 Cholesterol

Cholesterol is the fatty substance formed in the blood. Cholesterol is white fatty alcohol of steroid group found in body tissue, blood and bile, assists in synthesis of vitamin D and various hormones. Excessive deposits of cholesterol inside arteriosclerosis and coronary heart disease.
1.14.24 Low Density Lipo Protein

Low Density Lipo Protein is the major cholesterol carrying lipoprotein. Elevated LDL levels resulted in strong pre deposition to coronary heart disease, stroke and peripheral vascular disease.

1.14.25 High Density Lipo Protein

High Density Lipo Protein comprises the smallest portion of lipoproteins and the longest quantity of protein. This high density lipo protein may be associated with a lower risk of heart disease.