CHAPTER-1
INTRODUCTION

Endocrine disorders are increasing worldwide. Malfunctioning of the endocrine glands known as Endocrine Disorders can be assorted in two ways: (1) The inability of tissues to respond to hormones; and (2) Disturbances in the production of hormones which is called ‘Production Disorders’. There are two types of production disorders, seen in glands. (i) Hypofunction can result from a malformation in the gland, injury, disease, or abnormal hormones or enzymes. (ii) Hyperfunction is usually caused due to tumors or infections when the hormone does not respond to the feedback control mechanism.

Thyroid disorders are one of the most plentiful endocrine gland disorders in the world, second only after the diabetes mellitus (Heuck et al., 2000).

THYROID DISORDERS

The thyroid gland was first described in detailed by the English anatomist Thomas Wharton (1656), who considered it as an ‘excretory gland with a duct’ and gave it the name of Glandula Thyreoidea. Later on Hiller (1776) uncovered and highlighted first, the fact that thyroid is a ductless gland. In his research work he discovered the facts and presented a detailed description about thyroid gland. It is classically described as a flat-appearing, bi-lobed, pinkish structure of about 25 to 30 gm. weight, lying on either side of the trachea at the level in the neck lateroinferior to the thyroid cartilage. There is a connecting isthmus between the lobes which passes anteriorly across the trachea. It works under the direct control of the pituitary gland (anterior pituitary). Its function is to secrete a sufficient amount of thyroid hormones. These hormones promote and regulate a number of homeostatic functions. The hormones produced by the thyroid gland are Triiodothyronine (T3) and L-Thyroxine (Levothyroxin; T4).

The thyroid hormones act as a potent stimulus to the rate of cellular oxidation of all the cells in the body. The hormones function essentially as a regulator of cellular oxidation, and the difference between the vegetative level of metabolism maintained by the cells when thyroid hormone is wanting
and the metabolic level in health is due to this action. Thyroid hormone is manufactured, stored, and released in response to the body tissue needs and to the supply of iodine available to the organism. The thyroid is affected by disease elsewhere in the body, can cause disease through its own dysfunction, or can be the seat of disease.

**CLASSIFICATION OF THYROID DISORDERS**

It is shown in table-1.1 that production of three hormones in optimal quantity maintains a normal state or homeostasis. If the quantity of production increases or decreases beyond the reference range, it leads to several type of thyroid disorders. The production range of T<sub>3</sub>, T<sub>4</sub> and TSH determines the sub-clinical features of disorder and severity of symptoms.

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<th>Hormones</th>
<th>Thyroid Disorders</th>
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<td>TSH</td>
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*<sup>mIU/L</sup> = milli-international units per liter
TSH = Thyroid Stimulating Hormone

**HYPOTHYROIDISM**

Hypothyroidism can be considered as the "Clinical and Biomedical Syndrome" which is the state generated due to the reduction in the thyroid hormone production and also because of subnormal serum thyroid hormone concentrations. Hypothyroidism is a medical state when the gland thyroid stops producing sufficient concentration of thyroid hormone (Thyroxine, T<sub>4</sub>; Tri-iodinethyronine, T<sub>3</sub>). A number of terms have been used to denote the disease; it is also known as underactive thyroidism or thyroid deficiency. Patients with hypothyroidism have seen reduction in the production
rate and serum concentrations of T₃ and T₄ but increased rate of TSH level. When there is requirement of T₃ and T₄ and when the concentration of thyroid hormone is at minimum level, the Pituitary gland release *Thyroid Stimulating Hormone* (TSH), controlled by *Thyrotropin-Releasing Hormone* (TRH), secreted by hypothalamus, i.e. the thyroid gland is indirectly controlled by hypothalamus. Due to high concentration of TSH in the blood the Thyroid start secreting more hormones (T₃ and T₄) which raise the concentration of T₃ and T₄ in the blood, and once the blood concentration reach to the desired level of T₃ and T₄ in the blood, the Pituitary gland itself stop secreting TSH in the blood which stop the production/secretion of T₃ and T₄ by thyroid in the blood (Figure 1.1). Therefore, in thyroid deficiency or underactive thyroidism the patients diagnosed with high level of TSH.

![Figure 1.1: Thyroid Hormones](Adopted From: My.Health.Alberta.ca.)

**CLASSIFICATION OF HYPOTHYROIDISM**

Hypothyroidism, a clinical state, generated due to the inadequate synthesis of hormones from the thyroid gland and can be characterized as *overt* and *subclinical hypothyroidism*, also called *primary hypothyroidism*. It is clearly explicated in table 1.2 that in the state overt hypothyroidism, the
concentration of thyroid hormones (T₃ and T₄) comes to abnormally low level, whereas the concentration of TSH hormone in blood get raised and the patients are symptomatic. Subclinical hypothyroidism (SCHT) is also a Hypothyroidism state where the patients are asymptomatic due to the normal thyroid hormone concentration in the blood along with the raised TSH concentration. Here in this state the patients are found with the normal required concentration of T₃ and T₄, but the raised TSH or an amplified TSH response to TRH infusion, are describes as having a clinical state Sub-clinical Hypothyroidism (SCHT).

Table-1.2: Classification of Hypothyroidism by Laboratory Values.

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<tr>
<th>Hormones</th>
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<tr>
<td>TSH</td>
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*mIU/L=milli-international units per liter
TSH=Thyroid Stimulating Hormone

EPIDEMIOLOGY

Hypothyroidism is a clinical state which can occur at any age and substantially to a greater extent in women. Based on the population studied, the frequency of hypothyroidism varies. Tunbridge et al. (1977) defines that approximately 8 % to 10% of women, whereas 1% to 2% of men can have subclinical hypothyroidism, and most of these individuals show positive results for antithyroid microsomal antibodies. Vanderpump et al. (1995) and Wang (1997) state that approximately 80% thyroid related disease are found in females, whereas the women are more prone to have hypothyroidism as compared to the men.

"The National Health and Nutrition Examination Survey (NHANES III, 1988-1994), determined hypothyroidism in 4.6% of the US population (0.3% overt and 4.3% subclinical) and hyperthyroidism
in 1.3% (0.5% overt), with increasing preponderance with age in both females and males. The frequency of elevated serum TSH levels and thyroid microsomal antibodies is even 105 to 15% higher in postmenopausal women. In women prevalence rates of overt hypothyroidism vary from 0.5-1.5%, and may be as high as 4% in elderly women (Robuschi et al. 1987); these rates are about 1/10 as great in men. Overt hypothyroidism is found in 0.5-2% patients who are seeking medical care." (Riniker et al. 1981)

"According to statistics by the American Association of Clinical Endocrinologists (AACE, 2007) and other medical organizations, approximately 27 million Americans are experiencing a thyroid disorder. When compared to the AACE statistics for Americans who experience diabetes, which is approximately 16 million, the number of people with thyroid disease exceeds that by more than 40%. This makes thyroid disease, the most common endocrine disorder in the USA. The statistics of survey shows the increasing rate of hypothyroidism in population especially in women. Women appear to have a higher rate of hypothyroidism because of their grater rates of autoimmunity disease. As the prevalence of autoimmune disease rise with age, the prevalence of overt and subclinical hypothyroidism (SCHT) also rises with age, particularly in women."

**DIAGNOSIS**

"Symptoms of hypothyroidism tend to develop with TSH levels of 5.50 mIU/L or greater and correspond to the degree of hormone deficiency. Sign and symptoms are varied and include cold intolerance, constipation, muscles cramps, paresthesias, menstrual disturbances (amenorrhea or menorrhagia) (Orenstein et al. 1988), dyspnea, dizziness, syncope, reduced hearing, poor appetite, weight gain, brittle and thinning hair, husky voice, slowed deep tendon reflexes (DTRs), bradycardia, cardiomegaly, low-voltage complexes on electrocardiogram (ECG), elevated levels of cholesterol and triglycerides, and normochromic, normocytic anemia from a reduced rate of red blood cell (RBC) production. Psychiatric symptoms include depressed mood, apathy, impaired memory and
concentration, and long response latency (Matuzas et al. 1987). Hypothyroidism also may contribute to treatment-refractory depression. A psychotic syndrome of auditory hallucinations and paranoia called *myxedema madness* has been described in some patients. In severe cases, there may be diminished cerebral blood flow, with subsequent coma or death (Hall et al 1982). Further, subclinical hypothyroidism (SCHT) may produce depressive symptoms and cognitive deficits, although these tend to be less severe than those produced by overt hypothyroidism. SCHT increases more than double the lifetime risk of developing major depression." (Ragson, Hendrick, & Garrick, 2005)

**ETIOLOGY**
"Antibodies against the thyroid are the most prevalent cause of hypothyroidism. Because autoimmune disease occurs more often in women-the result of female reproductive hormones on immunological response-hypothyroidism predominates in women. The symptoms of hypothyroidism may result from decreased postsynaptic β-receptor number and function associated with low levels of thyroid hormones. Hypothyroidism additionally is associated with reduced central serotonin (5-HT) activity. Brain synthesis of 5-HT is reduced in hypothyroidism, and the PRL and cortisol responses to the 5-HT agonist fenfluramine are blunted in hypothyroid patients, as compared to euthyroid controls, suggesting reduced central 5-HT activity. Also, serum 5-HT levels correlate positively with serum T₃ levels. The elevated T₄ activity that has been observed in psychiatric patients may reflect a compensatory mechanism to maintain normal brain levels of thyroid function. The increase of (the prohormone) T₄, rather than (the active hormone) T₃, renders more T₄ available for uptake into the brain without increasing peripheral thyroid activity, which would place a metabolic strain on the body. Alternatively, the elevated T₄ levels may reflect a lower rate of peripheral conversion of T₄ to T₃."
COURSE AND PROGNOSIS

"The onset of hypothyroidism is usually gradual, except in cases of surgical or chemical thyroid ablation. Hypothyroid disorders in children (known as cretinism) may produce permanent physical and mental retardation. The physical and mental symptoms in adults are usually reversible with thyroid replacement. However, long-standing hypothyroidism may produce permanent cognitive deficits, possibly from neuronal death resulting from thyroid deficiency in the brain. Depression in hypothyroid patients is unlikely to resolve until thyroid levels return to normal. Thyroid hormone alone may be sufficient to induce remission of the depressive changes, although standard antidepressant treatment may also be necessary for more severe cases. SCHT has been associated with rapid-cycling bipolar disorder and with refractoriness to antidepressant treatment. Additionally, SCHT has a high likelihood of progressing to overt hypothyroidism, particularly in women." (Ragson, Hendrick, & Garrick, 2005)

CAUSES OF HYPOTHYROIDISM

Figure-1.2: Causes of Hypothyroidism (Abbott India Limited., 2014)
Since ancient times health practitioners are curious to study that physical health is affected by psychosocial factors. The study of relationship between psychosocial factors and physical health emerged a new area of research termed as ‘Psychosomatic Medicine’. In present scenario, theorists and researchers suggested that there are no ‘Psychosomatic’ diseases per se and that all physical diseases have psycho-social components. These components may predispose to, initiate, or maintain illness.

LIFE STYLE

The term ‘Life style’ first coined by Alvin Toffler in 1939. He predicted an explosion of life style as diversity increases in post industrial societies. The term ‘life-style’ has been described in a variety of ways by different social scientists. It is used to designate some patterns of social life that could be grasped only in a more or less subjective and impressionistic way by abstracting from the objective material conditions of people’s life activity. Some researchers defined that it is a pattern of person’s living as expressed in his or her interests, activities, and opinions.

Bestuzhev-Lada (1974) thinks that a clear cut socio-psychological concept of ‘life-style’ should be used for the evaluation of the subjectively determined attitudinal and volitional traits of human behavior in a given society. He proposed a conceptual framework which includes the concepts of ‘way of life’ which comprises, summarizes and integrates ‘standard of living’, ‘Quality of Life’ (QOL) and ‘Life-style’. He propose to interpret ‘way of life’ as a mode of living, i.e. a complex combination of typical criteria of the life activity unfolded by an individual, a social group or a society as a whole. This life activity is being conceived in conjunction with its conditions, such as characterized by the standard of living and the QOL. Life-style, as a socio-psychological characteristic, forms an organic part of the way of life.

Thus, life-style is a broad pattern of assumptions, motives, coping skills and cognitive styles that characterize the behavior of a given individual and provide it stability. Each individual tends to develop relatively consistent life-style, an essential element of his motive pattern, the needs, goal
objects and means that characterize his strivings. Some persons are primarily concerned with love and relatedness, others with marital possessions and power and still others with personal growth and self actualization. The individuals’ motive pattern is in part a product of past rewards and punishment; in part an outgrowth or reality, possibility and value assumptions, and in part a reflection of the demands, limitations and opportunities of the environment.

A sedentary or unhealthy patterns of living is a major cause for approximately 23% of deaths from the primary chronic diseases viz. severe cholesterol problems, high blood pressure, health diseases, stroke, diabetes and thyroid cancers etc. Presently, a great deal of attention is being paid to the role of life-style factors in the development or maintenance of many health problems. Healthy life-style can be defined as voluntary health behavior based on making choices from the alternatives that are available in the individual situations (Cookerham et al. 1993).

**DIETARY HABITS OR FOOD INTAKE BEHAVIOR:** Unhealthy and poor food intake behavior or dietary habits contribute significantly to most diseases in all over the world. Consumption of high levels of cholesterol and saturated fat in food is associated with various types of diseases. High-calorie ingestion coupled with poor or low levels of bodily movement predisposes individual to overweight resulting in high blood pressure, diabetes and thyroid imbalance. Hypothyroidism is associated with being overweight, an increasingly prevalent lifestyle disease. When there is extra intake of food or calories when compared to the consumption or less of burning of calories due to lack of physical exercise and other activities, then there will be imbalance in the weight or energy causing overweight or obesity. The energy ‘in’ and ‘out’ has to be balanced to maintain good health and this balance and maintenance helps us in keeping healthy weight. Over a period of time the energy ‘in’ and ‘out’ maintained the same then the weight remains the same. More energy intake is compared to the energy used then we tend to gain weight. More energy burnt when compared to the
calorie intake then there may be weight loss. So, improving nutrition and maintaining normal body weight can help prevent hypothyroidism.

**SLEEPING BEHAVIOUR:** "Sleep is a behavioral state that is a natural part of every individual’s life. Individuals spend about \(\frac{1}{3}\) of their lives asleep. Nonetheless, people generally know little about the importance of this essential activity. Sleep is not just something to fill time when a person is inactive. Sleep is a vital activity, rather than an option. Even though the precise functions of sleep remain a mystery, sleep is important for normal motor and cognitive function. Every organism recognizes and feels the need to sleep. After sleeping, individuals recognize changes that have occurred, as they feel rested and more alert. Sleep actually appears to be required for survival."

(Todea, Herescu, & Rosca, 2012)

"It is not normal for a person to be sleepy at times when he or she expects to be awake. Problem sleepiness may be associated with difficulty concentrating, loss of energy, memory lapses, fatigue, emotional instability and lethargy. The prevalence of problem sleepiness is high and has serious consequences, such as drowsy driving or workplace accidents and errors. Lifestyle factors/habits and undiagnosed or untreated sleep disorders can cause problem sleepiness. Lifestyle habits include using alcohol or certain medications and not getting enough sleep, having an irregular sleep schedule. There are more than 70 known sleep disorders, *obstructive sleep apnea, insomnia, narcolepsy,* and *restless legs syndrome* are the most common. Large numbers of individuals suffering from these sleep disorders are unaware of, and have not been diagnosed or treated for their disorder." (Wong, 2009)

In addition, sleepiness can cause difficulties with feelings, thinking, attention, learning, and memory which may lead to psychosomatic health hazards.

**SOCIAL SUPPORT NETWORK:** ‘Social Support’ concept has variously been defined by the researchers as social bonds (Henderson, 1977), social support networks (Mueller, 1980), significant
social contact (Cassel, 1976), accessibility of social confidents (Brown et al., 1975), and individual companionship (Lynch, 1977). Formally it is known as ‘Social Support Network’, it provides a feeling of membership in a group of people who shared interest and social activities. Social support network means useful helping resources providing by others. Literature on social support suggests that it is very much important concern in our daily lives. This concept has also emerged as the moderator and mediator of stress, lack of problems, excessive worry, self preoccupation and stress proneness (Blazer, 1982; and House et al. 1982).

Recently social support has been classified into two categories: perceived support and receives support. Perceived support generally refers to the psychological sense of support derived from feeling of loved, valued, and part of a network of reliable and trusted social relationships (Gottlieb, 1985). It is more stable over time because it is not context dependent.

Perceived support represent concrete instances of helping derived from one’s social support network, with this help or ‘provisions’ usually being categorized as emotional support, instrumental support, appraisal support and informational support (House & Kahn, 1985). Some authors have used the term “enacted support” in the place of received support (Barrera, 1986; and Trady, 1985). The type of support a person receives and needs depends on the severity of illness, for example, instrumental or structural support may be more important for friends and family members. Emotional and informational support may be particularly important for people who are seriously.

Another approach which views ‘social support’ in terms of the subjectively experienced quality of social relationships of person. It is consistent with the idea that one strong relationship may be more important than wide social networks.

Five basic support dimensions that appear in most of the social support models are- *Emotional support*: the availability of friends in whom one can confide feelings and problems; *Instrumental support*: the availability of tangible assistance in the form of finances, home repairs, child care and transportation; *Informational support*: the availability of advice and practical information concerning
possible solution to a problem; *Esteem support*; represents the bolstering of a person’s sense of competence of self esteem by other people; *social integration or network support* refers to a person’s feeling part of a group whose members have common interest and concerns.

It is apparent that social support is multi-dimensional construct which not only represents that the person has social relationship but also indicates that he is esteemed and cared for. As a social activities or transactional he perceives that a support may comes from many different resources the person’s spouse or lover, family, friends, co-workers, physicians or community organizations. Social support is the kind of help that the person perceives from others i.e. *emotional, personal, practical, informational* and *instrumental*. The quality and amount of the support is more concerned with social support given by different sources. Cohen and Wills (1985) have defined social support in terms of functional support. According to them functional support indicates whether interpersonal relationship serve specific function or not (e.g. provide affection, feeling of belonging on material aid).

Social support correlates positively with self-esteem, extraversion and negatively with hostility, depression, neuroticism, loneliness, anxiety and lack of protection in diverse samples. The recent explosion of research in the area of social support has provided a wealth of information about the nature of the relationship between social support, stress, and health consequences. Reviewing these studies and critical reviews of research (Cobb, 1976; and Thoits, 1983) it can be seen that this area of investigation has been observational and generally a theoretical and for the most part devoid of attempts to create unifying models. This is not to be criticized, as observation is a necessary stage of scientific advancement (Kahn, 1979).

A social network provides a person with psychological supplies for the maintenance of material and emotional health. According to Shumaker and Brownnell (1984) supportive behavior would be seen as exchange of resources between at least two individuals perceived by the provider or the recipient. Many theories have been proposed by Berkman and Bereslow (1983) reveal mental, physical, emotional self-destructive health habit of a person may be due to lack of social support. This may be
the main cause for feeling of isolation, helplessness, hopelessness, negative or suicidal thoughts and depression. Recent research points out that ‘feeling of isolation’ affects the whole body and is the cause of heart disease and cancer as well as arthritis, gastrointestinal upsets, skin problems, headaches, and complication of pregnancy.

Support is a powerful preventive and healing process. Diseases can be prevented through social support. In the words of Dennis Jaffe (1980) ‘all disease are social disease’ which clearly through light on ‘social support structure’ without which the graph of body’s immune system fall to an extent. The researchers show the effect of absence and presence of social network to fight against or in origin of illness. The effect is related to body’s stress response. One who work lacks outlet for stress may have ‘stress related illness’ and on the other hand who fight or are has stress busters are much healthier. Ultimately it shows the vital role played by ‘social support system’ and ‘isolation’ in origin and fighting against disease.

SPIRITUAL ACTIVITY/BEHAVIOR: "Various authors attempting to define it have emphasized on aspects like feeling connected or belonging in the universe, believing in a power outside one’s self (Decker, 1993), searching for a sense of meaning or purpose, experiencing transcendence (Canda, 1995), seeking one’s ultimate and personal truths, knowing of the unity of visible and invisible (King, Speck, & Thomas, 1995), having an internalized relationship between the individual and the divine (Ganje-Fling & McCarty, 1996), encountering limits love, and moving toward personal wholeness." (Wulff, 1996)

"Since ancient times it is relentlessly believed that spiritual engagements further a sense of well-being. Researches in the contemporary psychology thought in their nascent state have reached a similar conclusion. It has been found that life style correlates positively with mystical experiences and people who have had spiritual experiences report tremendous positive feelings as compared to others." (Kennedy et al., 1994)
"Although religious and non-religious people tend to experience equal amounts to stress, it has been observed that religion may help people deal better with negative life events and their attendant stress. Individual with imperious religion faith report higher levels of satisfaction, greater personal happiness, and fewer negative consequences of traumatic life events." (Ellison & Gey et al. 1991)

"People engaging in spiritual pursuit report being generally happy, cheerful, at peace most of the time, rarely depressed, have excellent physical health, and are satisfied with the meaning and purpose they find in their lives." (Krishna, 1999)

"In modern societies where cohesive and supportive family structures are fast getting obliterated, spiritual and religious organizations provide much-needed social support which protects people from social isolation, bestows upon them a sense of belonging and self-esteem thereby equipping them to cope with stress and negative life events." (Cohen & Wills, 1985b; and Loewenthal, 1995)

"Spirituality helps depressive patients figure out a meaning or a purpose in their life, which they had lost due to their illness (Swinton, 2001). The resurrection of meaning and purpose brings back the hope and vigor to face the difficulties of life. A research study found that for every 10 point increase in a person’s intrinsic religiosity, there was a 70% increase in recovery from depressive symptoms post physical illness." (Koening, George & Peterson, 1998)

It is therefore assumed by the investigators that including spiritual practices in one’s life style may lead to higher life satisfaction and may lead to prevention of diseases.

**PHYSICAL ACTIVITY AND EXERCISE:** Physical activity is defined "as any body movement produced by the skeletal muscles and resulting in an increase in energy expenditure." (Bouchard et al. 1990)
This definition is a purely physiological one stripping the activity of its motive and meaning to the individuals, its unique position in the individuals’ life style and its place in the socio cultural situation, aspects which are all believed to influence health.

Depending on its intensity, physical activity varies in terms of its long term effects on the organism. In the light of the current scientific evidences the physiological health effects of very light and light activities are estimated as minor and inconsistent, except for psychological and social benefits. The recent evidence indicates that if ‘moderate’ activity for example, brisk walking, carried out continuously at least 30 minute daily, involves metabolic and physiological functions to such an extent that, with regular practice, important health benefits result in terms of weight control, blood pressure, glucose and lipid metabolism and reduced mobility and mortality (Bouchard et. al. 1994a; Fletcher et al, 1995; and Pate et. al. 1995). ‘Heavy’ and ‘Very heavy’ activities when carried out at least 20 minute at a time, three or four times a week result in the same as or possibly in even greater health benefits than ‘moderate’ activity (Bouchard et al. 1994b). Studies by Dishman & Sallis (1994) indicate that long term activities with duration over 6 months help in successful maintenance of health (Emery et al. 1992).

The understanding of health benefits of physical activity has rapidly increased in recent years. Especially during last two decades it has been proved by Old ridge, (1984), Ward & Morgan, (1984), & Dishman, et al., (1985), that adherence to physical activity is poor even in supervised program for physical activity. Data on the determination of physical activity have been obtained mostly from correlational studies of high intensity activity within supervised settings. Most of the intervention trials performed have also focused on high intensity activity with, as a rule, only a few months follow-up. Specific data on the unsupervised long term maintenance of health related physical activity is thus scarce.

Exercise plays a very critical role in reducing risk of hypothyroidism and can be very beneficial in promoting survival and longevity. For thyroid disorders it has been found that exercise helps in
promoting longevity and disease control. Thus exercise helps reduce over weight and not only improves long-term health, but reduces the risk of several co-morbid conditions including disease progression, obesity, osteoporosis, cardiovascular disease and endocrinological disease.

The investigator however feels that in their busy and hectic life schedules, many people especially women cannot find time for physical exercise while the other, who do not give it sufficient importance are not willing to find time for physical exercise. This is mainly due to their innumerous selfish desires to enjoy worldly pleasures or they have irrational and neurotic tendencies arising due to excessive attachment to their kith & kin. If people would engage themselves in rigorous physical activity no extra physical exercise are needed.

**STRESS**

Stress has been defined as a stimulus and also as a response. Stress stimuli or stressors are the three major type (Lazarus & Cohen, 1977): (i) *major changes or events* (wars & flood) that affect many; (ii) *major changes or events* (getting married, death of family member) that affect one or a few; (iii) and *daily hassles or incidents in daily living* which irritates and distress one. Hence describing stimuli to be stressors would depend on the response elicited by the stimuli. The stimulus-response is circular as it asks what (stimulus) elicits a stress response and what (response) indicates particular stressors.

**Selye's General Adaptation syndrome:** According to the concept of ‘*General Adaptation Syndrome*’ by Selye (1956), "when an organism confronts stressors, it mobilizes itself for action. The response itself is non-specific with respect to the stressor; that is regardless of the cause of the threat, the individual will respond with the same physiological pattern of reaction. Over time with repeated or prolonged exposure to stress, there will be wear and tear on the system. The General Adaptation Syndrome consists of three phases: in the first phase ‘*Alarm*’, the organism becomes mobilized to meet the threat. In the second phases, ‘*Resistance*’, the organism makes efforts to copy with the
threat, as through confrontation. The third phases, ‘Exhaustion’ occurs if the organism fails to overcome the threat and depletes its physiological resources in the process of typing."

**EFFECTS OF STRESS ON WELLBEING:** It is evident that chronic stressor is an important contributor to psychological and physical illness. Increasingly stress researchers are reaching to the conclusion that the chronic stressors of life may be more important than major life events in the developments of illness. There is evidence that chronic stressors have a much more powerful impact on health and wellbeing that do more eventful stressors (Perlin et al. 1982). Chronic stressors through their very persistence can wear down resources and diminish key elements of self concept. Sustained stressors that challenge one’s sense of control, exhaust coping efforts and deplete social support have the strongest negative effect on health (Perlin et al. 1990). The chronic stress has been found to be single strongest predictor of mental wellbeing in later life (Krause, 2004, 2005).

![Stress diagram](Source: Boundless.com)
Chronic stress may result from traumatic or stressful events whose residual effects may remain with the individual for years. This effect may be in the form of Post Traumatic-Stress Disorder. The exposure to natural and human made disaster can produce chronic mental health and physical health effects that maintain the virulence of the initial experience (Baum & Fleming, 1993). The symptoms that are most often used to characterize post traumatic stress disorder are insomnia, nightmare, flashback (acting or feeling as if the event is recurring); and increased sensitivity to new stressful events to a great extent (Baum & Spencer, 1997). Individual who had experienced chronic stress disorder were found to have significantly higher risk for circulatory, digestive, musculo-skeletal, metabolic, nervous system and respiratory disorders.

**How Stress Effect Hormones Secretion**

![Figure-1.4: Effect of Stress on Hormone Secretion](Source: Ruper, S., 2014)
A six stage model of stress (figure-1.5) was developed by Palmer (2001) to demonstrate the stress process.

Stress can have harmful psychosomatic and behavioural effects. Psychological and behavioural reactions to stress include hostility, irritability, poor concentration, mental mood changes, lowered self-esteem, resentment of short attention span, blocks supervision, depression, inability to make decisions and dissatisfaction, lack of interest, and diminished initiative and behavioural responses includes maladaptive activities, such as drinking or excessive eating, smoking, tardiness, absenteeism, turnover, and accident. Stress can also have aversive physical effects. In stress conditions, the sympathetic nervous system is activated to produce increased heart rate, peripheral vasoconstriction and increased blood pressure.

The emergency fight-or-flight reactions that apparently proved so useful through the course of evaluation may at times be maladaptive, particularly for humans. In others, the physiological reactions associated with the emergency response may put the body under strain which can lead to illness and even death. Alexander (1950) combined Freud’s theory and Cannon’s studies of autonomic functioning in his analysis of psychosomatic disease, and suggested that chronic anxiety...
caused by repressed conflicts triggers autonomic and endocrine reactions that can lead to organ dysfunction and disease.

**Hormonal Effects of Stress on Cognitive Functioning In Hypothyroidism**

Chronic over-secretion of stress hormones adversely affects brain function, especially memory. Too much cortisol can prevent the brain from laying down a new memory, or from accessing already existing memories. The renowned brain researcher, Sapolsky (2009) has shown that sustained stress can damage the hippocampus, the part of the limbic brain which is central to learning and memory. The culprits are glucocorticoids, a class of steroid hormones secreted from the adrenal glands during stress. They are more commonly known as corticosteroids or cortisol. During a perceived threat, the adrenal glands immediately release adrenalin. If the threat is severe or still persists after a couple of minutes, the adrenals then release cortisol. Once in the brain cortisol remains much longer than adrenalin, where it continues to affect brain cells. Cortisol also interferes with the function of neurotransmitters, the chemicals that brain cells use to communicate with each other. Excessive cortisol can make it difficult to think or retrieve long-term memories. That is why people get befuddled and confused in a severe crisis.
DeWied and his associate (1982, 1983) in a review of studies on the hormonal effects on fear responding suggested that oxytocin and vasopressin have their great role in learning and memory. DeWied and his colleagues found that to a remarkable extent vasopressin keeps avoidance responses and certain approach responses from being extinguished. In addition, vasopressin may protect against amnesia so absence of vasopressin is associated with several memory defects. DeWied (1983) suggested that vasopressin plays a central role in memory consolidation and retrieval, probably through its effects on septal area hippocampus which it influences via the cerebrospinal fluid (DeWied & Gispen, 1977). Another neuropeptide, oxytocin, appears to have central effects opposite to those of vasopressin. Its peripheral effects include the control of lactation and uterine contractions. Within the brain, it appears to render animals in effect ‘amnesic. DeWied argues that oxytocin and vasopressin have balanced roles in memory, forgetting, and the maintenance of new behavior patterns. In this regard, Kovacs, Bohus and DeWied (1981) suggest that these neuropeptides interact with adrenergic transmitter systems in the brain.

Figure 1.6 (Source: Shah, D. R. (2014).)
**Dunham’s Stress Model:** According to Dunham’s stress model (1980) the conceptual and operational definitions of stress model, for the most part, consistent with the still controversial *General Adaptation Syndrome* of Selye (1956). Other parts of the model, however, differ considerably from Selye’s ideas. The model identifies two major categories of stressors. The first of these are *physical* (e.g., temperature level, weight, light level, physical trauma, etc.) The second set of stressors is *nonphysical* and *primarily psychological or sociological* (e.g., role demands, role ambiguity, threat etc.). It is possible that a single environmental factor could have both physical and nonphysical stressor components.

*Figure- 1.7: Dunham’s Stress Model*

*Source: Dunham, R.B. (1980.)*
**Stressor-stress relationship:** A given stressor will not necessarily have the same influence on stress level across people and across time due to a variety of individual characteristics. The individual characteristics which influence the relationship between a stressor and stress level are both physical (e.g., strength, stamina) and nonphysical (primarily psychological or sociological, e.g., personality, ability, etc.).

Both types of individual characteristics can influence stress reactions to both physical and non-physical stressors although the major impact will usually be in the parallel area.

**Responses to stress:** There is an extremely long list of human responses to stress. The model identifies physical (e.g., skin disorders, ulcers, heart disease, etc.) and nonphysical (primarily psychological or sociological, e.g., perception of stress, anxiety, and mental fatigue dissatisfaction). It is likely that a given level of stress will be associated with a variety of both physical and non-physical responses. Similarly, changes in a person’s stress level are likely to lead to changes in multiple physical and non-physical responses. Physical responses to stress are somewhat more likely than non-physical responses when the stress level is strongly influenced by physical stressors (and vice versa), although both physical and nonphysical responses are routinely associated with stress levels regardless of the nature of the stressor.

Danhum has specifically treated perceptions of stress as a response to stress. This is done in full knowledge of the fact that some theorists claim that stress does not exists unless the person perceives the stress. He disagrees with this cognitive approach to stress in favour of the model, which treats stress as physiological state of the individual. Therefore, a person’s stress level exists and can be assessed independently of the person’s knowledge that she/he is at a particular stress level.

**Individual characteristics and stress response relationships:** A given level of stress will not necessarily produce the same response from two different people or even from the same person at two
different points in time due to a variety of individual characteristics. This influence of individual characteristics on responses to stress is distinct from the influence of individual characteristics on stressor-stress relationship. For example a high level of stress, may produce only minor responses for a person in good physical condition but lead to a major heart attack for an overweight, physically out-of-shape individual.

**Human response to stress and changes in individual characteristics:** The model of stress proposed a dynamic one containing two sets of ‘feedback loops’. The first set of feedback loops is concerned with changes in individual characteristics of persons which are due to human responses to stress. For instance, a person who responds to a high level of stress by having a heart attack will be in different physical and perhaps mental condition in the future. These changes in the characteristics of the person are likely to cause that person to respond differently in the future to both stressor and stress. It should be noted that not all changes in the person which result from stress will be negative, as many responses to stress will lead to an improved individual condition. This increase in confidence can influence the stressor stress relationship in such a way that a lower level of stress will be associated with the stressor (the exam) than in the past.

**Human responses to stress as stressors:** The second set of feedback loops in the model is also dynamic. It is proposed that human responses to stress can themselves become stressors. For example, a student may *choke* on a exam in response to stress. This choking phenomenon may itself become a physiological stressor-the person’s knowledge that she/he *chokes* in exams may cause that person’s stress level to increase.

The stress induced by this stressor may lead to additional *chokes* responses which later become stressors and a deadly pattern (response → stressor → stress → response → stressor → stress → etc.) is continues. In a similar manner, knowledge of a heart attack may act as a stressor which leads to
higher levels of stress which leads to additional heart attacks, etc. Thus, Dunham presented a complete dynamic stress model which responses to stress can change the characteristics of the person and in which these responses can become stressors in the future.

In the end, the view of stress to which psychological generally subscribe is that stress can neither be understood adequately in terms of the threatening stimulus nor in terms of the response to the stimulus-physiological or cognitive but in terms of the interaction or transaction between the stimulus and the responding individual. Within this framework several views of stress have been presented which differ particularly as to the intra individual process or entity threatened and the factors determining in the mode of reaction exhibited to cope with the factors determining in the mode of reaction exhibited to cope with the threatening stimulus.

**PERSONALITY**

Personality can be defined as a dynamic and organized set of Characteristics possessed by a person that uniquely influences his or her cognitions, motivations, and behaviors in various situations. The word ‘Personality’ originates from the Latin word ‘Persona’, which means ‘mask’. Significantly, in the theatre of the ancient Latin-speaking world, the mask was not used as a plot device to disguise the identity of a character, but rather was a convention employed to represent or typify that character. There are several theoretical perspectives on personality in psychology, which involve different ideas about the relationship between personality and other psychological constructs, as well as different theories about the way personality develops.

In this complex society pleasing personality is important for success and happiness of an individual because personality is considered to be great significant in all areas of life whether it would be home or office and is also important in all sorts of interactions across hierarchal and relational level. Earlier concept of personality came from the Greek word *Persona* meaning ‘a mask’ that was
used in dramas by actors to hide their own identity. In the present contemporary world personality stresses more on motivational and behavioral aspects which emphasize both ‘on how individual appears in the world’ and ‘what he actually is’, the way individual appears in world is done consciously by him it is for two different reasons—Persons desire to create favorable impression on others and his desire to judge accurately the personality of others.

Knowing and understanding about personality is an old pursuit but it was in the early 20th century when the birth of personality psychology had taken place. Modern theorist of psychology had made their efforts by giving formal shape to the personality development in 1930’s. Some studies revealed the both heredity and environment in shaping personality but certain studies have revealed that personality is not inherited but it is the product of learning in environment which occurs during prolonged social relationship in the society. Environmental influences inside home and outside help persons to develop their personality, hence accordingly people learn to behave and deal with the people in society. Thus, from the recent studies it is difficult to consider personality wholly as heredity based or wholly as environmental based hence, personality is considered as an outcome of both heredity and environmental influences.

One of the early psychologists Rainwater in 1956 stressed on hereditary foundation of personality. Revealing the hereditary role of personality he doesn’t emphasize that genes play role directly or personality pattern are directly controlled by genes. He argued, genes indirectly affect the quality of nervous system, chemical balance in the body and the structure of body also. In view of environmental influences, it is found that environment influences the personality of an individual in three different way i.e., by encouraging the hereditary potentials; by environment itself which provide personality pattern model which the individual uses as guide and learning opportunities provided by environment. Behaviorist psychologist Watson (1925) supported that the hereditary potential can be molded into any desired personality pattern. Watson also claimed that new born baby can be molded into anything the significant people in his environment desires.
After describing the controversial role of heredity and the environment in the development of personality now ongoing discussion will pertain towards defining personality. Psychologists gave different views in defining personality. Personality tends to be an integral aspect of one’s life thus for layman defining personality is very simple, as they assess the personality only through the way people like them, their way of working, talking and so on but according to psychologists certain controversies still exist regarding definition of personality due to nature-nurture issue.

According to Pervin (1980) "Personality represents those structural and dynamic properties of an individual or persons as they reflect themselves in characteristic response situation." On the other hand Mischel (1976) also mentioned personality is the distinctive pattern of behavior (including emotions and thoughts) that characterizes each individual’s adaptation to the situation of his/her life. He emphasized on inner qualities and behavior but especially on behavior.

According to these definitions personality to be ultimately define in terms of behavior and that consistency within a single individual consistency across all the individuals and consistency along the groups of individuals are the salient features of personality, as far as definition of personality is concerned one of the important reason to have the concept of personality is that we want to describe an individual as an integrated behaving unit i.e. an occasional anger outburst by an individual would not brand him as hostile person, however if he were to show frequent displays of temper he would probably be considered to be an angry or hostile person, hence it is the unit of trait that would define as an angry or hostile person, now what traits are, why they are so called?

According to Guilford (1959) "a trait is any distinguishable relatively enduring way in which one individual differs from others." Allport (1937) suggests that a generalized and focalized Neuro-physic system (Peculiar to individual), with the capacity to render many stimuli functionality equivalent and initiate and guide consistent (equivalent) form of adaptive and expressive behavior, if behavior changes, dose this means that one of our trait has changed, or has environment influenced our behavior.
BRAIN DYSFUNCTIONS

Cognitive function is the global term indicating a range of mental activity. ‘Cognitive impairment’ is one of the most feared symptoms of thyroidism. Although there are changes in cognitive functioning in thyroidism, these rarely affect daily functioning at an early stage (Nazliel et al. 2008). But beyond certain limit it creates problems. Cognition is usually examined within five broad areas: Attention, Language, Memory, Visio-Spatial Attention and Conceptualization (Albert, 1988). Within each domain there are many specific functions, neurophysiologists organize their analysis of cognitive functioning within hierarchy that range from the simplest functions (e.g. attention) to the most complex (abstract thinking and problem solving). In other words, if basic processes like attention are impaired, all higher order processes will be affected. Since hypothyroidism usually develops slowly, and the early complaints are frequently minor, vague and diffuse in nature, it is not surprising that the diagnosis is often overlooked.

Several researchers found that people with an hypothyroidism can lead to progressive loss of interest and initiative, slowing of mental processes, poor memory for recent events, general intellectual deterioration, depression, and eventually, if not checked, to dementia and permanent harmful effects on the brain. Besides deterioration in physiological functioning’s impairments in cognitive performance has been widely used as a reliable index of stress. Review of studies by a number of scholars (McGrath, 1976; Lazarus & Cohen, 1977) indicates that while mild stress may facilitate rather than impair the performance of many individuals, severe stress generally results in performance deterioration. Perception, thoughts, judgment, problem solving, perceptual and motor skill may get adversely affected. In addition to this, frequent forgetfulness, hypersensitivity to criticism, mental blocks and stereotype in thinking and cognizing are the other manifestations of severe stress.

Deterioration in cognitive functioning under stress has been explained in terms of impairment in the information processing system. That is, severe stress affects adversely the extraction on crucial information from the stimulus, and thereafter its storage and retrieval. Besides, processing of the
information in the context of the information stored earlier experiences of similar nature also gets affected. The deterioration in information processing system brought about by stress may be of particular relevance to higher order cognitive functioning, such as, thinking and problem solving, which require looking at the problem situation from different angles, generation and testing of alternative hypotheses ideationally.

Impairment in cognitive performance of individual with hypothyroidism like impairment in physiological functioning as an index of stress also suffers from certain limitations. The same situation may produce deterioration in some and facilitation in some other individuals. Further the same situation may be responded quite differently by different individuals depending upon differences in their motivational and dispositional setup. However, inspite of these limitations, deterioration in cognitive performance has been considered to be a more reliable index of stress than impairment in psychological functioning in under active thyroidism or thyroid deficiency.

**JUSTIFICATION**

It is a fact that thyroid hormones not only play an important part in the health of metabolic endocrine, nervous and immune systems, they in turn have an important role to play in the health and optimal functioning of brain. On the basis of various findings it was found that the central features of all hypothyroid conditions are affected by emotional, motivational, cognitive and somatic manifestations. Emotional manifestations include depressed mood, loss of interest or pleasure, inability to experience pleasure. In the motivational manifestation psychomotor agitation or retardation, failure or loss of energy, concentration problems etc. are included. Cognitive manifestation consists of negative thinking, low self-esteem, and inability in making decisions, hopelessness, pessimism, and suicidal thoughts etc. Somatic manifestation has weight changes, sleep and appetite changes etc. Studies on
thyroidism subjects have indicated that these serious psycho-somatic symptoms affecting the patient’s quality of life adversely. The present research is planned for comprehensive analysis of psychological variables of hypothyroidism and their management thorough the psychological intervention.

The investigator is wishes to explore to what extent psychological variables viz. Life style, Stress, Personality and brain dysfunction contribute towards the prediction of hypothyroidism and what kind of personality traits and lifestyle hypothyroid females possess in comparison to their normal counterparts. Part-I of the present study is devoted to comprehensive analysis of psychological variables of hypothyroid condition and the comparison between hypothyroid patients and normal subjects on the psychological aspects (or variables) of hypothyroidism. Part-II of the study is devoted to the management of hypothyroidism with the help of psychological intervention including techniques of behavior modification.