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Awareness and Prevalence of Hyperthyroidism and Hypothyroidism in Endocrine Disordered Patients of Bangladesh.

A research report submitted to the Department of Pharmacy, East West University, in Partial fulfillment of the requirement for the degree of Bachelor of Pharmacy

SUBMITTED BY:

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Declaration by the Research Candidate

I, Marzia Rahman Rafa , hereby declare that the dissertation entitled "Awareness and Prevalence of Hyperthyroidism and Hypothyroidism in Endocrine Disordered Patients of Bangladesh." submitted to the Department of Pharmacy, East West University in the partial fulfillment of the requirement for the award of the degree Bachelor of Pharmacy is a bonafied record of original research work carried out by me during 2015, under the supervision and guidance of **Ms. Nigar Sultana Tithi, Senior Lecturer,** Department of Pharmacy, East West University. The research has not formed the basis for the award of any other degree/diploma/fellowship or other similar title to any candidate of any university.

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Certificate by the Supervisor

This is to certify that the dissertation -" Awareness and Prevalence of Hyperthyroidism and Hypothyroidism in Endocrine Disordered Patients of Bangladesh." submitted to the department of pharmacy, East West University was carried out by **Marzia Rahman Rafa** (ID: 2012-1-70-019) in partial fulfillment of the requirements of the degree of Bachelor of Pharmacy under my guidance. No part of this
Research has been submitted for any other degree.

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This is to certify that the thesis - "Awareness and Prevalence of Hyperthyroidism and Hypothyroidism in Endocrine Disordered Patients of Bangladesh." submitted to the Department of Pharmacy, East West University in partial fulfillment of the requirements of the degree of Bachelor of Pharmacy was carried out by **Marzia Rahman Rafa** (ID: 2012-1-70-019).

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List of Abbreviation

Abbreviation	Elaboration
CRH	Corticotrophin-releasing hormone
ACTH	Adrenocorticotropic hormone
GnRH	Gonadotropin-releasing hormone
LH	Luteinizing hormone
FSH	Follicle-stimulating hormone
TRH	Thyrotropin-releasing hormone
TSH	Thyroid-stimulating hormone
GH	Growth hormone
T4	Thyroxine
T3	Triiodothyronine
PTH	Parathyroid hormone
MEN type 1	Multiple Endocrine Neoplasia type 1
MEN type 2	Multiple Endocrine Neoplasia type 2
NIS	Na/I symporter
TPO	thyroid peroxidase
MIT	Monoiodotyrosine
DIT	Diiodotyrosine
cAMP	Cyclic Adenosine monophosphate
PIP2	Phosphatidylinositol
TBG	Thyroid-binding globulin
BMI	Body Mass Index
DPG	2,3-diphosphoglycerate
RIA	Radioimmunoassay
PTU	Propylthiouracil

HLA	Human leucocyte antigen
Tg Ab	Thyroglobulin antibody
TSH-R	Thyroid-stimulating hormone receptor
FT3	Free triidothyronine
FT4	Free thyroxine
JAT	Juvenile Autoimmune Thyriditis

Abstract

Thyroid disorder is the second most common endocrine disorder in women both in the developed and less developed world and it is raising significantly. As, thyroid hormone is very important to maintaining body's major functions including reproduction and growth so, any imbalance can lead to severe health problem. So, a study was conducted on 402 endocrine disordered patients in 7 renowned institutions to know the prevalence of Hyper and Hypothyroidism, their diagnosis, treatment pattern, and knowledge level and also their awareness regarding this diseases in Bangladesh. This survey was conducted by face to face interview of patients and on the basis of their prescriptions and medical test reports and Obtained data are analyzed by Microsoft excel. Among 194 thyroid disordered patients the prevalence of hyper and hypothyroidism in our country is almost similar (50%). But women are the main victim of both Hyperthyroidism (78.26%) and Hypothyroidism (77.84%). The highest suffering age was 20-40 years. The most common diagnosis test is TSH test (97.87%) because it is effective and cheap. Hyperthyroidism having patients are treated mainly with anti-thyroid drugs (Carbimazol), and hypothyroidism containing patients are treated with thyroid hormone therapy (Levothyroxine) because most of the patients in our country are subclinical patients. Majority, 73.13% patients were educated, so they was conscious about their diagnosis and were found to take medication timely. But unfortunately their knowledge level about their disease history and perception about recovery was not so satisfactory. Prevalence of thyroid disorder among endocrine patients in this study is very high also (48.26%). From our so study we find that, knowledge level of patients of our country is relatively poor and needs to be improved. So, some steps should be taken by the authority with the help of professionals to make them aware of this disease.

Key words: Thyroid gland, Endocrine system, Hyperthyroidism, Hypothyroidism, TSH test, Prevalence, Medication, Knowledge level.

Chapter 1
Introduction

1 Introduction

1.1 Endocrine system

The endocrine system refers to the collection of glands of an organism that secrete hormones directly into the circulatory system to be carried towards distant target organs. The glands of the endocrine system and the hormones they release influence almost every cell, organ, and function of our bodies. The endocrine system is instrumental in regulating mood, growth and development, tissue function, and metabolism, as well as sexual function and reproductive processes (Endocrine System, 2015).

1.1.1 Parts of endocrine system: The major endocrine glands include the pineal gland, pituitary gland, pancreas, ovaries, testes, thyroid gland, parathyroid gland, hypothalamus, gastrointestinal tract and adrenal glands.

1.1.2Hormonessecretion by endocrine system:The endocrine system is in contrast to the exocrine system, which secretes its hormones using ducts. The endocrine system controls many ways of the body functions. It produces hormones that travel to all parts of your body to maintain your tissues and organs. The areas governed by the endocrine system are - Reproduction, Responses to stress and injury, Growth and sexual development, Body energy levels, internal balance of body systems, Bone and muscle strength. Endocrine system produces, stores and releases hormones. When everything goes smoothly, the body functions properly (Martini and Nath, 2006).

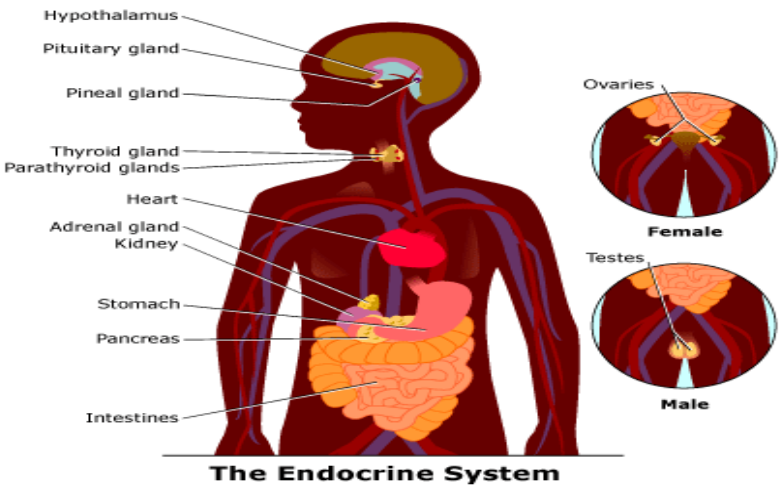


Figure 1.1:Endocrine System

1.1.3 Endocrine system's organ and their functions

Table 1.1: Endocrinesystem's orangs and their functions (Sturmhofel and Bartke ,1998).

Endocrine Gland	**Hormones**	**Primary hormone functions**
Hypothalamus	Corticotropin-releasing hormone (CRH)	Stimulates the pituitary to release adrenocorticotropichormone (ACTH).
	Gonadotropin-releasing hormone (GnRH)	Stimulates the pituitary to release luteinizing hormone (LH) and follicle-stimulating hormone (FSH).
	Thyrotropin-releasing hormone (TRH)	Stimulates the pituitary to release thyroid-stimulatinghormone (TSH).
	Growth hormone	Stimulates the release of growth hormone (GH) from the(GHRH) pituitary.
	Somatostatin	Inhibits the release of GH from the pituitary.
	Dopamine	Inhibits the release of prolactin from the pituitary.
Anterior pituitary gland	ACTH	Stimulates the release of hormones from the adrenal cortex.
	LH	In women, stimulates the production of sex hormones (i.e.,estrogens) in the ovaries as well as during ovulation; inmen, stimulates testosterone production in the testes.
		FSH In women, stimulates follicle development; in men, stimulates sperm production.
	TSH	Stimulates the release of thyroid hormone.
	GH	Promotes the body's growth and development.
	Prolactin	Controls milk production (i.e., lactation).
Posterior pituitary gland	Vasopressin	Helps control the body's water and electrolyte levels.

	Oxytocin	Promotes uterine contraction during labor and activatesmilk ejection in nursing women.
Adrenal cortex	Cortisol	Helps control carbohydrate, protein, and lipid metabolism, protects against stress.
	Aldosterone	Helps control the body's water and electrolyte regulation.
Testes	Testosterone	Stimulates development of the male reproductive organs,sperm production, and protein anabolism.
Ovaries	Estrogen	Produced by the follicle. Stimulates development of the female reproductive organs.
	Progesterone	Produced by the corpus luteum. Prepares uterus for pregnancy and mammary glands forlactation.
Thyroid gland	Thyroid hormone (i.e., thyroxine [T4] and triiodothyronine [T3])	Controls metabolic processes in all cells.
	Calcitonin	Helps control calcium metabolism (i.e., lowers calciumlevels in the blood).
Parathyroid gland	Parathyroid hormone (PTH)	Helps control calcium metabolism (i.e., increases calciumlevels in the blood).
Pancreas	Insulin	Helps control carbohydrate metabolism (i.e., lowers bloodsugar levels).
	Glucagon	Helps control carbohydrate metabolism (i.e., increasesblood sugar levels).

1.1.4 Functioning pathway of endocrine gland

Once a hormone is secreted, it travels from the endocrine gland through the bloodstream to target cells designed to receive its message. Along the way to the target cells, special proteins bind to some of the hormones. The special proteins act as carriers that control the amount of hormone that is available to interact with and affect the target cells. Also, the target cells have receptors that latch onto only specific hormones, and each hormone has its own receptor, so that each hormone will communicate only with specific target cells

that possess receptors for that hormone. When the hormone reaches its target cell, it locks onto the cell's specific receptors and these hormone-receptor combinations transmit chemical instructions to the inner workings of the cell. When hormone levels reach a certain normal or necessary amount, further secretion is controlled by important body mechanisms to maintain that level of hormone in the blood. This regulation of hormone secretion may involve the hormone itself or another substance in the blood related to the hormone. For example, if the thyroid gland has secreted adequate amounts of thyroid hormones into the blood, the pituitary gland senses the normal levels of thyroid hormone in the bloodstream and adjusts its release of thyrotropin, the pituitary hormone that stimulates the thyroid gland to produce thyroid hormones (Endocrine System, 2015).

1.2Endocrine diseases

Endocrine diseases are disorders of the endocrine system. Endocrine disorders may be subdivided into three groups: 1.Endocrine gland hypo secretion (leading to hormone deficiency), 2.Endocrine gland hyper secretion (leading to hormone excess),3.Tumours (benign or malignant) of endocrine glands. Endocrine disorders are often quite complex, involving a mixed picture of hypo secretion and hyper secretion because of the feedback mechanisms involved in the endocrine system. For example, most forms of hyperthyroidism are associated with an excess of thyroid hormone and a low level of thyroid stimulating hormone. The most common thyroid disorders are-

Adrenal disorders: Adrenal insufficiency, Addison's disease, Mineralocorticoid deficiency, Diabetes, Adrenal hormone excess, Conn's syndrome, Cushing's syndrome, Glucocorticoid remediable aldosteronism (GRA), Pheochromocytoma, Congenital adrenal hyperplasia (adrenogenital syndrome), Adrenocortical carcinoma.

Glucose homeostasis disorders: Diabetes mellitus, Type 1 Diabetes, Type 2 Diabetes, Gestational Diabetes, Mature Onset Diabetes of the Young, Hypoglycemia, Idiopathic hypoglycemia, Insulinoma, Glucagonoma.

Thyroid disorders: Goiter, Hyperthyroidism, Graves-Basedow disease, Toxic multinodular goiter, Hypothyroidism, Thyroiditis, Hashimoto's thyroiditis, Thyroid cancer, Thyroid hormone resistance.

Parathyroid gland disorders: Primary hyperparathyroidism, Secondary hyperparathyroidism, Tertiary hyperparathyroidism, Hypoparathyroidism, Pseudohypoparathyroidism.

Calcium homeostasis disorders: Osteoporosis, Osteitisdeformans , Rickets and osteomalacia.

Sex hormone disorders: Hermaphroditism, Gonadal dysgenes, Androgen insensitivity syndromes, Hypogonadism (Gonadotropin deficiency), Disorders of Puberty, Amenorrhea, Polycystic ovary syndrome.

Tumours of the endocrine glands :Multiple endocrine neoplasia, MEN type 1, MEN type 2a, MEN type 2b , Carcinoid syndrome (Martini and Nath , 2006).

1.3 Thyroid Gland

One of the most important organ of endocrine system is thyroid. The thyroid is a 2-inch-long, butterfly-shaped gland weighing less than 1 ounce. Located in the front of the neck below the larynx, or voice box, it has two lobes, one on each side of the windpipe. The thyroid is one of the glands that make up the endocrine system. The glands of the endocrine system produce and store hormones and release them into the bloodstream. The hormones then travel through the body and direct the activity of the body's cells. The thyroid gland makes two thyroid hormones, triiodothyronine (T3) and thyroxine (T4). T3 is made from T4 and is the more active hormone, directly affecting the tissues. Thyroid hormones affect metabolism, brain development, breathing, heart and nervous system functions, body temperature, muscle strength, skin dryness, menstrual cycles, weight, and cholesterol levels. The thyroid gland makes two thyroid hormones, T3 and T4. Thyroid hormone production is regulated by TSH, which is made by the pituitary gland in the brain. Thyroid hormone production is regulated by thyroid-stimulating hormone (TSH), which is made by the pituitary gland in the brain. When thyroid hormone levels in the blood are low, the pituitary releases more TSH. When thyroid hormone levels are high, the pituitary responds by dropping TSH production (Sturmhofel and Bartke ,1998).

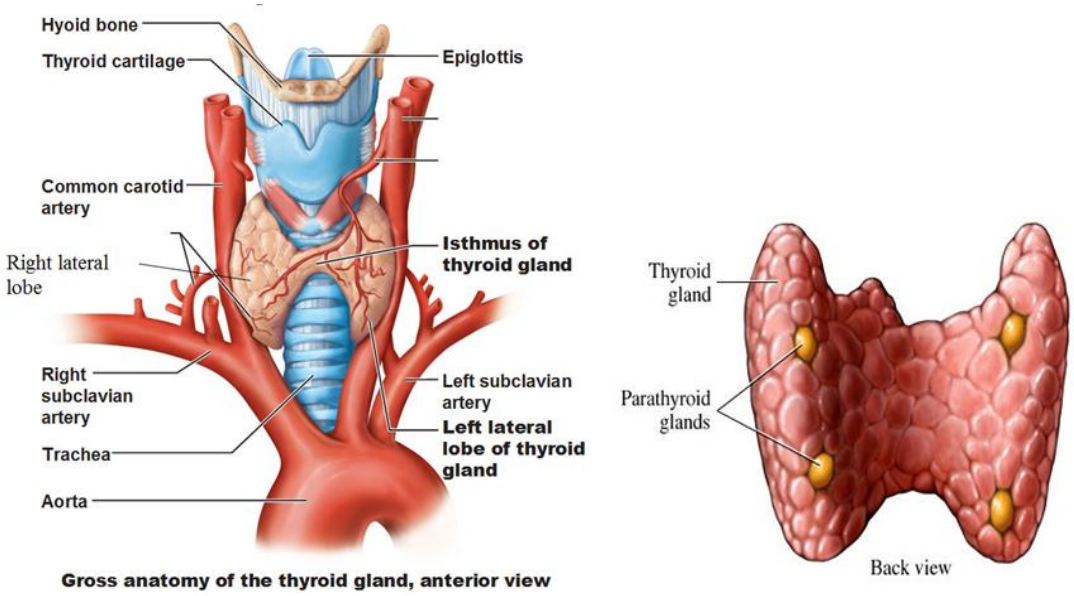


Figure1.2: The thyroid gland. Anterior and Posterior view.

1.3.1 Hormones of Thyroid gland

The thyroid gland synthesizes and secretes three hormones:

• Thyroxine (T4).

• Tri-iodothyronine (T3).

• Calcitonin. (Calcitonin is involved with calcium homeostasis) (Jack, 2001).

Synthesis of T_3 and T_4:

Formation of Thyroid Hormones

The thyroid hormones T3 and T4 are formed in a large prohormone molecule, thyroglobulin, themajor component of the thyroid and more precisely of the colloid. Thyroglobulin is synthesized in the thyroid follicular cells and secreted into the lumen of the follicles. It is an iodinated glycoprotein (660,000 daltons) made up of two identical subunits, each with a molecular weightof 330,000 daltons. It is of special importance because it is necessary for the synthesis of thyroidhormones and represents their form of storage.

The formation of the thyroid hormones depends on an exogenous supply of iodide. The thyroidgland is unique in that it is the only tissue of the body able to accumulate iodine in large quantities and incorporate it into hormones. The formation of thyroid hormones involves the acomplex sequence of events including:

(1) active uptake of iodide by the follicular cells,

(2) oxidation of iodide and formation of iodotyrosyl residues of thyroglobulin,

(3) formation of iodothyronines from iodotyrosines,

(4) proteolysis of thyroglobulin and release of T4 and T3 into blood, and

(5) conversion of T4 to T3 (Jack, 2001).

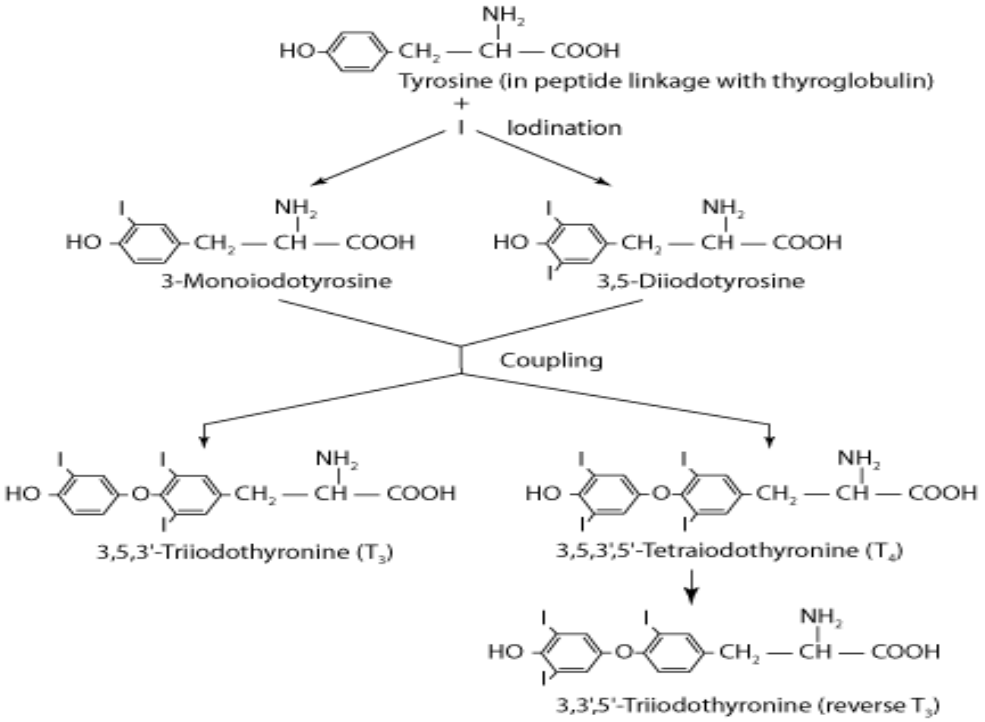


Figure1.3: Synthesis of Thyroid Hormone.

1.3.2Synthesis Process

Thyroid hormones are formed in the lumen of follicles, not in the cells. The process of T3 and T4 synthesisinvolves the processing of tyrosine and iodine followed by a reaction to bind them together. T3 and T4 are synthesized by three or four iodination reactions.

1.3.3Thyroglobulin synthesis:

Tyrosine is converted into the glycoprotein thyroglobulin, which contains approximately 110 tyrosine residues. The processing of iodine involves two stages as plasma iodine concentrations are very low.

Iodine Trapping: Plasma iodide ions (I–) are actively transported from the plasma into the follicular cells against a steep concentration gradient by the Na/I symporter (NIS). This is a rate-limiting step.

Iodide oxidation: I– is rapidly oxidized into iodine (I2) by thyroid peroxidase (TPO) anchored on the luminal surface of the follicular cell membrane. The two components are then combined in the colloidal lumen.

Iodination of thyroglobulin: Reactive iodine rapidly attaches to the tyrosine molecules within the extracellular thyroglobulin in a process that is catalysed by TPO. Monoiodotyrosine (MIT or T1) and diiodotyrosine (DIT or T2) are formed.

Coupling: Tyrosine molecules within thyroglobulin are then coupled together. Combinations of T1 and T2 can form thyroid hormones:

• T3 is made from T1 + T2.

• T4 is made from T2 + T2.

Only a small proportion of coupling reactions form T3 and T4 (yumpu.com, 2015).

1.3.4Secretion: Under the direction of thyroid stimulating hormone (TSH or thyrotrophin), iodinated thyroglobulin is taken into the follicular cells by pinocytosis and degraded by lysosomal enzymes. Coupled tyrosine molecules are released, including some T3 and T4. Some T4 is converted to T3 in the follicular cell cytoplasm by the enzyme type 1,5'deiodinase. Whilst the secreted ratio of T4:T3 is usually 20:1 conversion to T3 is promoted by TSH stimulation and can result in the so-called T3 thyrotoxicosis. MIT and DIT are also released, but they are deiodinated by iodotyrosinedeholgenase to recycle iodine (yumpu.com, 2015).

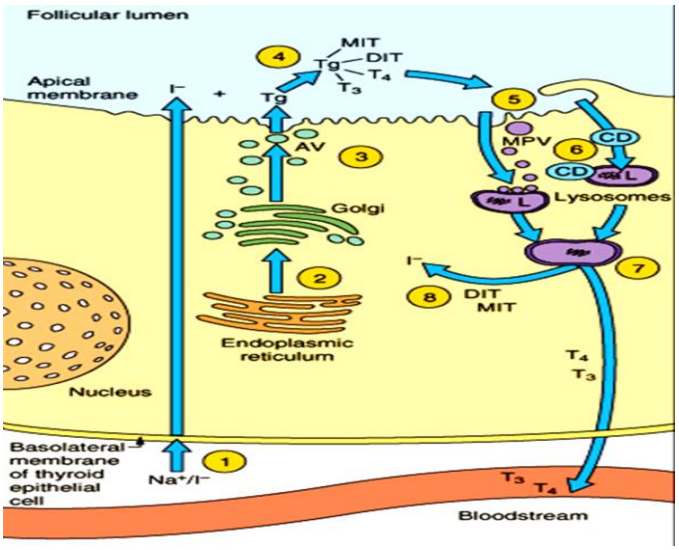


Figure1.4: Synthesis and secretion of thyroid (T_3 and T_4) hormone.

1.3.5Regulation of thyroid hormone (T_3 &T4) in the body

Hypothalamic thyrotrophin-releasing hormone (TRH) stimulates the release of thyroid-stimulating hormone (TSH) from thyrotrophs in the anterior pituitary gland and also causes upregulation of TSH gene transcription. TSH acts on extracellular receptors (TSH-R) on the surface of thyroid follicle cells, activating the Gprotein–adenyl-cyclase–cAMP and phosphatidylinositol (PIP2) pathways. Ultimately, TSH stimulates the following processes in the thyroid gland:

- Iodine uptake.
- Transcription of thyroglobulin and thyroid peroxidase.
- Iodination.
- Coupling.
- Type 1 5'deiodinase conversion of T4 to T3.
- Pinocytosis and secretion of thyroid hormones.

As a result, T3 and T4 are synthesized and secreted more rapidly. TSH also has long-term actions on the thyroid gland by increasing its size and vascularity to improve hormone synthesis. TSH forms part of a negative feedback loop, as its release is inhibited by increased serum T3 and T4 and also by somatostatin, glucocorticoids and chronic illness(yumpu.com, 2015).

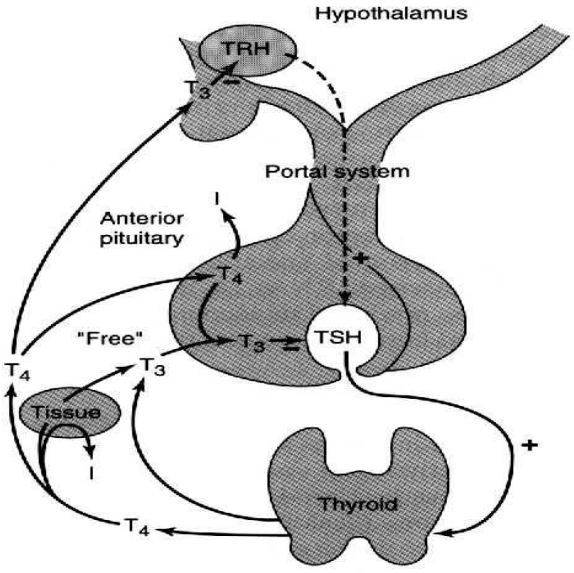


Fig1.5: Regulation process of thyroid hormone.

1.3.6Transport of thyroid hormones in the body

The thyroid hormones circulate bound to plasma proteins produced in the liver, which protect the hormones from enzymic attack- 70% are bound to thyroid-binding globulin (TBG), 30% are bound to albumin. Only 0.1% of T4 and 1% of T3 are carried unbound—it is this free (unbound) fraction that is responsible for their hormonal activities.Both T3 and T4 can cross cell membranes, though acarrier transport may be involved.The concentration of circulating T4 is much higherthan that of T3 (50:1). There are two reasons for this:

• The thyroid secretes more T4 than T3.

• T4 has a longer half-life (7 days vs 1 day) (yumpu.com, 2015).

1.3.7Mechanism of thyroid hormone

- The general effect of thyroid hormone is to activate nuclear transcription of large numbers of genes
- Therefore, in virtually all cells of the body, great numbers of protein enzymes, structural proteins, transport proteins, and other substances are synthesized.
- The thyroid hormone receptor usually forms a heterodimer with *retinoid X receptor (RXR)* and binds at specific *thyroid hormone response* elements on the DNA.
- This hormone receptor complex then initiates the transcription of many genes.
- The thyroid hormones increase the metabolic activities of almost all the tissues of the body (Nowak, 2009).

1.3.8Physiological effects of thyroid hormone

Thyroid hormones, especially T3, enter tissue cells by diffusion or specific transport where they bind to two different receptors nuclear receptors designated as hTR-α1 and hTR-β1. The T3- receptor complex then binds DNA via “zinc fingers” and this produces a change in the expression of a variety of genes that encode enzymes that control cellular metabolism and function. Thyroid hormones effect normal growth and development (particularly in bone and CNS), help regulate lipids (adipose tissue), increase absorption of carbohydrates from intestine, increase protein breakdown in muscle, increases dissociation of O2 from hemoglobin by increasing RBC 2,3-diphosphoglycerate (DPG).

They also stimulate increased O2 consumption and metabolic rate in most metabolically active tissues (exceptions are brain, testes, uterus, lymph nodes, spleen and anterior pituitary).Thus the thyroid hormones increase cellular respiration and thereby increase the basal metabolic rate (BMR) (Jack, 2001).

Table 1.2: Physiological effect of thyroid hormone in different body parts (The Thyroid and Thyroid hormones, 2001).

Target Tissue	Effect	Mechanism
Heart	Chronotropic	Increase number and affinity of beta-adrenergic receptors.
	Inotropic	Enhance responses to circulating catecholamines. Increase proportion of alpha myosin heavy chain (with higher ATPase activity).
Adipose tissue	Catabolic	Stimulate lipolysis.
Muscle	Catabolic	Increase protein breakdown.
Bone	Developmental and metabolic	Promote normal growth and skeletal development; accelerate bone turnover.
Nervous system	Developmental	Promote normal brain development.
Gut	Metabolic	Increase rate of carbohydrate absorption.
Lipoprotein	Metabolic	Stimulate formation of LDL receptors.
Other	Calorigenic	Stimulate oxygen consumption by metabolically active tissues (exceptions: adult brain, testes, uterus, lymph nodes, spleen, anterior pituitary). Increase metabolic rate.

1.4Thyroid diseases

Thyroid disease consists of a multitude of disorders affecting the production or secretion of thyroid hormones resulting in an altered metabolic state. The clinical and biochemical syndromes resulting from too little or too much thyroid hormone production are called hypothyroidism and hyperthyroidism, respectively.

The thyroid gland is prone to a number of diseases that can alter its function and structure. These diseases frequently have wide-ranging systemic effects because thyroid hormones regulate the metabolism of almost every cell in the body. The main categories of disease are:

- Hyperthyroidism—excess of thyroid hormone production.
- Hypothyroidism—deficiency of thyroid hormone production.

• Goitre formation.

• Adenoma (benign growths) of the thyroid.

• Carcinoma of the thyroid(Martini and Nath, 2006).

1.4.1Hyperthyroidism

Hyperthyroidism is defined as an overactive thyroid gland, leading to excess thyroid hormones (T4 and T3). When this becomes symptomatic it is called thyrotoxicosis. Thyrotoxicosis can occur in the absence of true hyperthyroidism. This phenomenon is seen during inflammation of the thyroid (thyroiditis), which stimulates the release of stored hormone or can be the result of excess exogenous thyroid hormone (thyrotoxicosis factitia) or ectopic hormone production (ovarian struma or metastatic thyroid cancer) It is a common disorder affecting 1/50 females and 1/250 males.

1.4.2 Signs and symptoms of Hyperthyroidism

Table 1.3: Signs and symptoms of Hyperthyroidism (Hechtman, 2011).

Signs and symptoms of Hyperthyroidism	
Organ affected	Signs and symptoms
skin	Warm, moist, finely textured skin, increased sweating, fine hair, vitiligo, pigmentation change, alopecia, pretibial myxedema.
Head, Eyes, Ear, Nose & Throat	Chemosis,proptosi, impairment of extraocular motion, visual loss, several nerve impairment, opthalmopathy, mild proptosis, lid retraction, lid lag, conjunctival infection.
Neck	Diffused enlargement of thyroid gland, well defined pyramidal lobe, thyroids brults, thyroid nodule.
Cardiovascular	Gynecomastia, trachycardia, hyperdynamic precordium, ectopic beats, irregular heart rate & rhythm.
Abdomen	Hyperactive bowel sound
Neurologic	Head tremor, hyperactive deep tendon reflex.

musculoskeletal	Kyphosis, iordosis, loss of weight, proximal muscular weakness, hypokalaemia, paralysis in some cases.
psychiatric	Restlessness, anxiety, irritability, insomnia, depression.
General	Increased basal metabolic rate, weight loss, increased body temperature, heat intolerance.

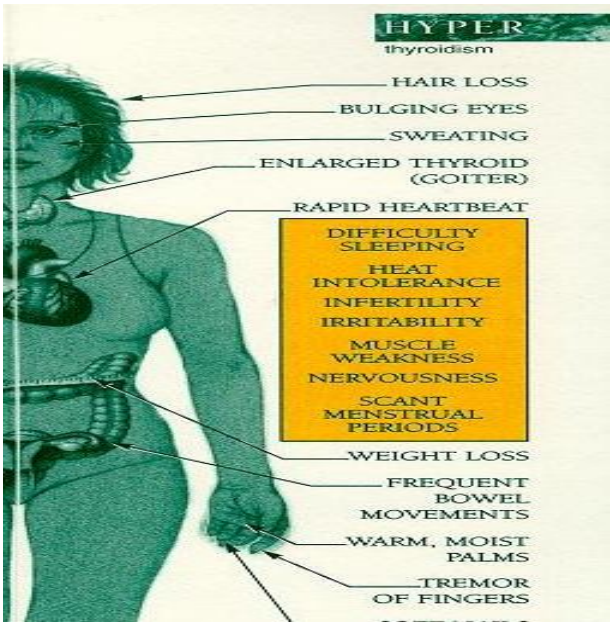


Fig1.7: symptoms of hyperthyroidism.

Presentation is usually slow with a history lasting over 6 months. An acute exacerbation of symptoms is called a thyrotoxic crisis; it is usually brought on by infection in previously undiagnosed patients. Surgery or radioactive ablation of the thyroid gland can also be responsible as the damaged thyroid follicles release their contents (yumpu.com, 2015).

1.4.3 Infertility in hyperthyroid disordered women

Menstrual disturbance in hyperthyroidism were described by Von Basedow in 1840. On study shows that, menstrual irregularities in 64.7% of hyperthyroid women. Again some studies shows that, 5.8% women may have primary or secondary infertilities. Auto immune thyroid disease is the most common auto immune disorder in female population affecting 5-10% of women of childbearing age, and secondly, in most frequent cause of thyroid failure (subclinical & overt hyperthyroidism).

Due to the impact of thyroid antibodies in implantation and potential risk of miscarriage all patients with autoimmune sub type should be appropriately assessed and protect against this negative outcome (Hechtman, 2011).

1.4.4Causes of hyperthyroidism

The main causes of hyperthyroidism are:

• Diffuse toxic goiter: Graves' disease—an autoimmune disease involving autoantibody stimulation of TSH receptors.

• Toxic multinodulargoiter—nodular enlargement of the thyroid in the elderly.

• Toxic nodule—autonomously functioning thyroid nodule; most are adenomas (benign thyroid hormone producing tumors).

• Lymphocytic thyroiditis—inflammation causes release of stored hormones (followed by hypothyroid phase).

• Subacute thyroiditis—thyroiditis associated with a painful goiter.

Less common forms of hyperthyroidism:

1. Jod-Basedow phenomenon is an overproduction of thyroid hormone following a sudden, large increase in iodine ingestion—through either a sudden reversal of an iodine-deficient diet or the introduction of iodide or iodine in contrast agents or drugs (e.g., the antiarrhythmic agent amiodarone).

2. Factitious hyperthyroidism occurs with abusive ingestion of thyroid-replacement agents, usually in a misguided effort to lose weight. Diagnosis is aided by the absence of glandular swelling and of exophthalmos and the lack of autoimmune activity found in Grave's disease.

3. Subclinical hyperthyroidism refers to patients without clinical symptoms, a normal FT4 and FT3 and TSH levels below the lower limits of normal (0.4 mIU/L). Currently, there is insufficient evidence to support treatment because consequences of non-treatment are minimal (yumpu.com, 2015).

1.4.5Diagnosis

Thyroid function tests are the main component of diagnosis. Serum TSH, free T3, and free T4 are measured by radioimmunoassay (RIA). Raised T3 and T4 indicate that hyperthyroidism is present. Raised TSHsuggests the fault lies in or above the pituitary gland, whereas low TSH points to a thyroid organ lesion. Other tests include:

• Autoantibody detection, e.g. Graves' disease.

• Radioisotope scanning to show the size of the thyroid gland and any abnormal 'hot' areas such as a toxic adenoma.

• ECG for sinus tachycardia or atrial fibrillation (yumpu.com, 2015).

1.4.6Treatment

1.4.6.1 Antithyroid Drugs

A. Beta-adrenergic blocking agents-Propranolol

I. Propranolol (Inderal) reduces some of the peripheral manifestations (e.g. tachycardia, sweating, severe tremor, nervousness) of hyperthyroidism.

II. In addition to providing sympotomatic relief, propranolol inhibits the peripheral conversion of T4 to T3.

B. Methimazole: Methimazole prevents thethyroid from using iodine to produce thyroid hormone. Methimazole is sometimes also called thiamazole, and is used around the world. It is generally taken once per day. It is available under the brand-name Tapazole in the US, and also as a generic from various manufacturers.

C. Propylthiouracil (PTU): PTU acts by preventing the thyroid from using iodine to produce thyroid hormone, and also inhibits T4 from being converted into T3. It has a short-acting timespan, and must be taken two to three times per the day to effectively lower thyroid hormone levels. Only generic PTU is available; there are no brand names of PTU marketed in the US, and a number of manufacturers produce generic PTU.

D.Carbimazole: Carbimazole metabolizes to methimazole in the body. Like methimazole, carbimazole inhibits the thyroid's ability to produce thyroid hormone. The most well-known brand of carbimazole is Neomercazole. Carbimazole is quite similar in action to methimazole (About.com Health, 2015).

Therapeutic uses of these drugs include **(1)Definitive treatment** in which remission is achieved **(2)Adjunctive therapy** with radioactive iodine until the radiation takes effect **(3)Preoperative preparation** to establish and maintain a euthyroid state until definitive surgery can be performed.

(4) Radioactive iodine therapy 131I is only taken up by thyroid tissue; it kills the cells leading to reduced T3 and T4 synthesis. The response is slow and carbimazole may be required. The benefits include a reduced chance of relapse and taking away the need to take carbimazole, which carries risk of agranulocytosis, in the long term (yumpu.com, 2015).

1.4.7 Dosage and Administration of Anti-Thyroid Drugs

Antithyroid drugs work best when a constant amount is available in bloodstream. To maintain that constant level, it's important to take the antithyroid drug dose at the proper times, and if patients are taking more than one pill a day, evenly space their doses. Generally, methimazole is taken once a day (or twice a day for those on larger doses), and PTU is taken 3 to 4 times per day, or every 6 to 8 hours (About.com Health, 2015).

1.4.8 Functions of Anti-Thyroid Drugs

It's important to note that antithyroid drugs do not block the effects of thyroid hormone that was made by the gland before starting the drug. So generally, even after you begin taking an antithyroid drug, your thyroid will continue to release the hormone it has already formed, causing continued hyperthyroidism symptoms. It can take as many as six to eight weeks, therefore, for elevated thyroid hormones to begin to normalize, and symptoms of hyperthyroidism to subside (About.com Health, 2015).

1.4.9 Effectiveness of Antithyroid Drugs

An estimated 25 to 50% of patients go into remission when taking an antithyroid drug for at least six months to a year. This is most likely if -

- They have mild or subclinical hyperthyroidism.
- Their goiter (thyroid enlargment) is small or minimal.
- They are not a smoker.
- They do not have high levels of blocking antibodies.
- They are not a child, teen or young adult.

- They do not have ophthalmopathy.

Some studies have shown that remission rates are higher when you take antithyroid drugs for more than 18 to 24 months versus 6 to 12 months, but the findings are still controversial. While some 30 to 40 percent of patients treated with antithyroid drugs remain in remission 10 years after they stop their drug treatment, an estimated half of the patients who have a remission will also have a recurrence (About.com Health, 2015).

1.5Hypothyroidism

Hypothyroidism is a disorder that occurs when the thyroid gland does not make enough thyroid hormone to meet the body's needs. Thyroid hormone regulates metabolism—the way the body.uses energy—and affects nearly every organ in the body. Without enough thyroid hormone, many of the body's functions slow down. It is slightly less common than hyperthyroidism, affecting 1/100 females and 1/500 males.(yumpu.com, 2015)

1.5.1Classification

1.Primary hypothyroidism (90% of hypothyroidism cases)
a. Gland destruction or dysfunction caused by disease or medical therapies (e.g., radiation, surgical procedure).

b. Failure of the gland to develop or congenital incompetence (i.e., cretinism)

2. Secondary hypothyroidism

Result of a pituitary disorder that inhibits TSH secretion. The thyroid gland is normal but lacks appropriate stimulation by TSH.

3. Tertiary hypothyroidism

Refers to a condition in which the pituitary–thyroid axis is intact, but the hypothalamus lacks the ability to secrete TRH to stimulate the pituitary.

4. Subclinical hypothyroidism

Refers to patients without clinical symptoms, a normal T4, and elevated TSH levels. Currently, there is insufficient evidence to support treatment because consequences of non-treatment are minimal. However, pregnant women with subclinical hypothyroidism may benefit from T4 replacement (yumpu.com, 2015).

1.5.2Causes of hypothyroidism

Hypothyroidism has several causes, including

- Hashimoto's disease
- thyroiditis, or inflammation of the thyroid
- congenital hypothyroidism, or hypothyroidism that is present at birth
- surgical removal of part or all of the thyroid
- radiation treatment of the thyroid
- some medications (yumpu.com, 2015).

1.5.3 Signs and symptoms of Hypothyroidism

1.4 Table: Signs and symptoms of Hypothyroidism (Hechtman, 2011)

Signs and symptoms of Hypothyroidism	
Organs affected	Signs and Symptoms
Central Nervous System	Depression, fatigue, lethargy, forgetfulness, decreased concentration, memory deficit, slow thinking, cold intolerance, nerve entrapment syndrome, decreased sewating, ataxia, headach.
Mucleoskeletal	Muscular weakness,cramps, myalgia, arthralgia, delayted relaxation and reflex phase.
Cardiovascular	Bradycardia, diastolic hypertension, hyperlipidaemia, hypercholestrolaemia,ascites, hyperhomocysteinamia, poor blood circulation.
Haematological	Iron deficiency anemia
Respiratory	Shortness of breath.
Gastrointestinal tract disorder	Anorexia, constipation, sluggish bowel transit time, flatulence, bloating.

Ear,Nose,&Throat	Puffy eye, enlarged tongue, hearing impairment, goiter, hoarseness of voice, dysphagia, sore throat.
Immune System	Poor immune response, recurrent infection.
Genitourinary	Impaired kidney function.
Female Reproduction	Low libido, infertility, menstrual irregularities, menorrhagia, galactorrhoea, hyperprolactinemia, fibrocystic breast disease.
Integumentary	Dry skin, mucous membrane (mouth, vagina, anus), coarse skin,brillte hair, nail, hair loss, thin nail.
Male reproduction	Low libido, infertility, impotence.
Radiological	Pericardial & pleural effusion, pituitary gland enlargement.
General	Weight gain, edema causing facial features to look sweel and look puffy.

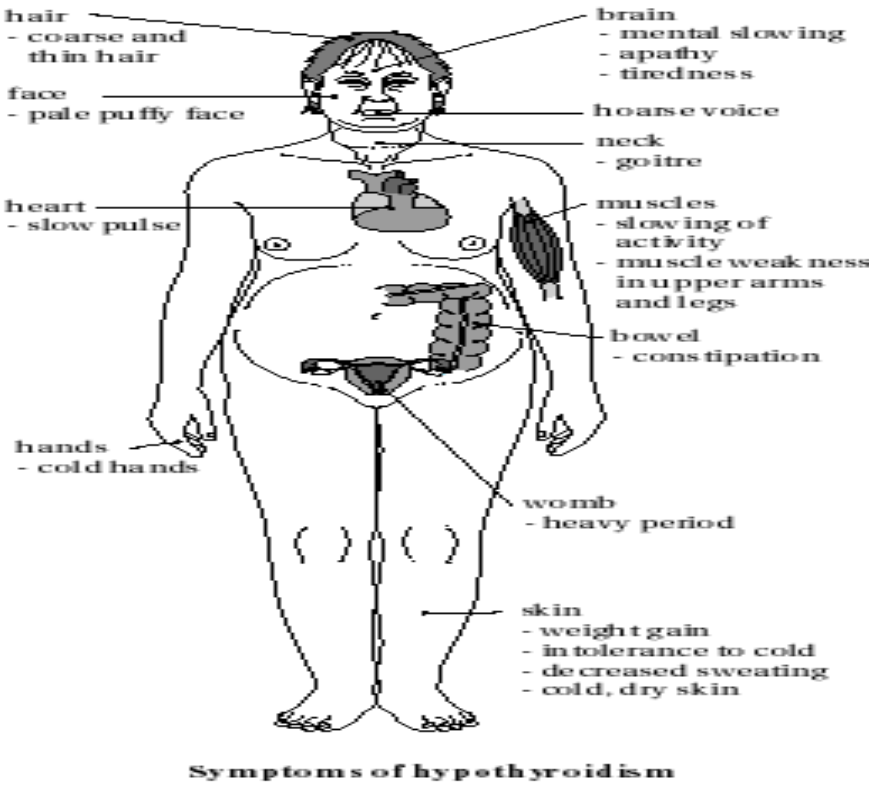


Figure 1.8: Symptoms of hyperthyroidism

1.5.4 Hypothyroidism causing in-fertility in both male and female

In women of fertile age autoimmune thyroid disease is the most common cause of hypothyroidism, as in most patients thyroid peroxidase anti body is found. Hypothyroidism is associated with broad spectrum of reproductive disorders ranging from abnormal sexual development to menstrual irregularities and infertility. A number of hypotheses for this occurrence include, the followings-

- Subclinical thypothyroidism can be seen to alter the dynamics of prolactin release with unknown consequence for gonadal function and fertility.
- Hyperprolactinaemia resulting from increased production of TSH has been implicated in ovulatory dysfunction and in 1-3% of cases galactorrhoea.
- Diminishes the secretion and synthesis of dopamine in the hypothalamus, could account the loss of dopaminergic inhibitory influences on prolactin, and luteinizing hormone.

  Hypothyroidism interferes with normal physiological pulsatile gonadotrophin releasing hormone secretion,a prerequisite for normal follicular development and ovulation. A delay in LH response may lead to inadequate corpus luteum progesterone secration. Disturbance in normal pulsatile release of LH and hyperprolactinaemia can cause in menstrul cycle dysfunction,ranging from anovulatory cycles with menorrhagia, oligomenorrhoea or amenorrhoea. Thyroid hormone receptors are expressed in human oocytes, cumulus cells and granulosa cells.that's why thyroid disease is warranted for infertility (Hechtman, 2011).

However, hypothyroidism develops slowly, so many people don't notice symptoms of the disease.

Symptoms more specific to Hashimoto's disease are a goiter and a feeling of fullness in the throat.

Hypothyroidism can contribute to high cholesterol, so people with high cholesterol should be tested for hypothyroidism. Rarely, severe, untreated hypothyroidism may lead to myxedema coma, an extreme form of hypothyroidism in which the body's functions slow to the point that it becomes life threatening. Myxedema requires immediate medical treatment (Hechtman, 2011).

1.5.5 Diagnosis

Hypothyroidism is not investigated as thoroughly as hyperthyroidism, since treatment does not vary. Free T3 and T4 levels are low, whereas TSH levels are usually raised. If TSH is low then a lesion of the hypothalamus or pituitary is likely. Autoantibodies can be detected in Hashimoto's thyroiditis (yumpu.com, 2015).

1.5.6 Treatment

Health care providers treat hypothyroidism with synthetic thyroxine, a medication that is identical to the hormone T_4. The exact dose will depend on the patient's age and weight, the severity of the hypothyroidism, the presence of other health problems, and whether the person is taking other drugs that might interfere with how well the body uses thyroid hormone.

Health care providers test TSH levels about 6 to 8 weeks after a patient begins taking thyroid hormone and make any necessary adjustments to the dose. Each time the dose is adjusted, the blood is tested again. Once a stable dose is reached, blood tests are normally repeated in 6 months and then once a year.

Hypothyroidism can almost always be completely controlled with synthetic thyroxine, as long as the recommended dose is taken every day as instructed (yumpu.com, 2015).

1.6 Some other thyroid disorders

1.6.1 Graves' disease

Graves' disease, the most common form of thyrotoxicosis, is an autoimmune disease in which autoantibodies against the TSH receptors stimulate the receptors so that thyroid hormones are produced in excess. Graves' disease is the most common cause of hyperthyroidism; it is especially common in middleaged women (B:D, 8:1) and it has a genetic component with some human leucocyte antigen (HLA) association. The disease follows either a relapsing-remitting course or one with fluctuating severity. Rarely Graves' disease can progress to hypothyroidism with time. Graves' disease can cause the classical picture of hyperthyroidism with bulging eyes (exophthalmos), goitre (with bruit) and swollen legs (pretibial myxedema). It is diagnosed by detection of autoantibodies along with low TSH and raised T3. The thyroid autoantibodies, thyroglobulin antibody (Tg Ab) and thyroid peroxidase (TPO) antibody, are present in both Graves' disease and

Hashimoto's thyroiditis. However, stimulating thyroid-stimulating hormone receptor (TSH-R) antibodies are specific to Graves' disease. The treatment is consistent with other causes of hyperthyroidism, but radioactive iodine and surgery are especially likely to cause hypothyroidism (yumpu.com, 2015).

1.6.2 Hashimoto's thyroiditis

When the thyroid gland is inflamed, the disease is called thyroiditis. This can be caused by autoimmune or viral processes. Hashimoto's thyroiditis is a destructive autoimmune disease that is especially common in middle-aged women. It is mediated by autoantibodies against rough endoplasmic reticulum (microsomal antibodies) or thyroglobulin. The presence of these antibodies can be tested to confirm the diagnosis. The thyroid gland is infiltrated by lymphocytes that cause the gland to enlarge, forming a goitre. The initial destruction of the thyroid gland can release the thyroglobulin colloid causing temporary hyperthyroidism. The patients usually progress to a euthyroid (normal) state and finally develop progressive hypothyroidism (yumpu.com, 2015).

1.6.3 Goitres

A goitre is a swelling in the neck caused by an enlarged thyroid gland. It is a common finding, and it is usually asymptomatic; however, large goitres can compress the oesophagus and trachea. If a goitre is associated with hyperthyroidism it is described as toxic'. Non-toxic goitres secrete normal or reduced levels of thyroid hormones. Non-toxic goitres are usually the result of excessive TSH stimulation in the presence of hypothyroidism. Goitres are treated by correcting the underlying pathology or by surgical removal for cosmetic reasons or to prevent compression of surrounding structures.

1.6.3.1 Cause of Goiter

Goiters can occur when the thyroid gland produces either too much thyroid hormone (hyperthyroidism) or not enough (hypothyroidism). Much more rarely, the problem may arise when the pituitary gland stimulates thyroid growth to boost production of the hormone. Enlargement could also occur with normal production of thyroid hormone, such as a nontoxic multinodular gland.

Another type of thyroid growth, called a sporadic goiter, can form if your diet includes too many goiter-promoting foods, such as soybeans, rutabagas, cabbage, peaches, peanuts, and spinach. Keep in mind you would have to eat huge amounts of these foods to cause a goiter. These foods can suppress the manufacture of thyroid hormone by interfering with your thyroid's ability to process iodide. Historically, the most common cause used to be a lack of iodide in the diet, however in the 1920s iodized salt was introduced in the U.S. now making this a rare cause of goiters. Iodine is added to other foods as well (WebMD, 2015).

1.6.4 Thyroiditis

Inflammation of the thyroid gland can cause swelling, and infiltration by lymphocytes can also cause enlargement. The goitre formed is usually slightly nodular, but it may be tender if the inflammation is acute.

Types:

- **Subacute thyroiditis.** This condition involves painful inflammation and enlargement of the thyroid. Experts are not sure what causes subacute thyroiditis, but it may be related to a viral or bacterial infection. The condition usually goes away on its own in a few months.
- **Postpartum thyroiditis.** This type of thyroiditis develops after a woman gives birth.
- **Silent thyroiditis.** This type of thyroiditis is called “silent” because it is painless, as is postpartum thyroiditis, even though the thyroid may be enlarged. Like postpartum thyroiditis, silent thyroiditis is probably an autoimmune condition and sometimes develops into permanent hypothyroidism (About.com Health, 2015).

1.7 Thyroid Disease in Pregnancy

The thyroid diseases hyperthyroidism and hypothyroidism are relatively common in pregnancy and important to treat. The thyroid is an organ located in the front of your neck that releases hormones that regulate your metabolism (the way your body uses energy), heart and nervous system, weight, body temperature, and many other processes in the body.

During pregnancy, if you have pre-existing hyperthyroidism or hypothyroidism, you may require more medical attention to control these conditions during pregnancy, especially in the first trimester. Occasionally, pregnancy may cause symptoms similar to hyperthyroidism in the first trimester. If you experience palpitations, weight loss, and persistent vomiting, you should contact your physician.

Untreated thyroid diseases in pregnancy may lead to premature birth, preeclampsia (a severe increase in blood pressure), miscarriage, and low birth weight among other problems. It is important to talk to your doctor if you have any history of hypothyroidism or hyperthyroidism so you can be monitored before, and during pregnancy and your treatment adjusted if necessary (Aleppo, 2014).

1.7.1 Symptoms of Hyperthyroidism and Hypothyroidism in Pregnancy

Hyperthyroidism

Symptoms of hyperthyroidism may mimic those of normal pregnancy, such as an increased heart rate, sensitivity to hot temperatures, and fatigue. Other symptoms of hyperthyroidism include the following:

- Irregular heartbeat
- Nervousness
- Severe nausea or vomiting
- Slight tremor
- Trouble sleeping
- Weight loss or low weight gain for a typical pregnancy

Hypothyroidism

Symptoms of hypothyroidism, such as extreme tiredness and weight gain, may be easily confused with normal symptoms of pregnancy. Other symptoms include:

- Constipation
- Difficulty concentrating or memory problems
- Sensitivity to cold temperatures
- Muscle cramps(Aleppo, 2014).

1.7.2 Causes of Thyroid Disease in Pregnancy

The most common cause of maternal hyperthyroidism during pregnancy is the autoimmune disorder **Grave's disease**. In this disorder, the body makes an antibody (a

protein produced by the body when it thinks a virus or bacteria has invaded) called thyroid-stimulating immunoglobulin (TSI) that causes the thyroid to make too much thyroid hormone.

The most common cause of hypothyroidism is the autoimmune disorder known as **Hashimoto's thyroiditis.** In this condition, the body mistakenly attacks the thyroid gland cells, leaving the thyroid without enough cells and enzymes to make enough thyroid hormone.

1.7.3 Diagnosis of Thyroid Disease in Pregnancy: Hyperthyroidism and hypothyroidism in pregnancy are diagnosed based on symptoms, physical exam, and blood tests to measure levels of thyroid-stimulating hormone (TSH) and thyroid hormones T4, and for hyperthyroidism also T3.

1.7.4 Treatment of Thyroid Disease in Pregnancy

For women who require treatment for hyperthyroidism, an antithyroid medication that interferes with the production of thyroid hormones is used. This medication is usually propylthiouracil or PTU for the first trimester, and — if necessary, methimazole can be used also, after the first trimester. In rare cases in which women do not respond to these medications or have side effects from the therapies, surgery to remove part of the thyroid may be necessary. Hyperthyroidism may get worse in the first 3 months after you give birth, and your doctor may need to increase the dose of medication.

Hypothyroidism is treated with a synthetic (manmade) hormone called levothyroxine, which is similar to the hormone T4 made by the thyroid. Your doctor will adjust the dose of your levothyroxine at diagnosis of pregnancy and will continue to monitor your thyroid function tests every 4-6 weeks during pregnancy. If you have hypothyroidism and are taking levothyroxine, it is important to notify your doctor as soon as you know you are pregnant, so that the dose of levothyroxine can be increased accordingly to accommodate the increase in thyroid hormone replacement required during pregnancy. Because the iron and calcium in prenatal vitamins may block the absorption of thyroid hormone in your body, you should not take your prenatal vitamin within 3-4 hours of taking levothyroxine (Aleppo, 2014).

1.8 Thyroid statistics

27,000,000 people in the US and 200 million worldwide have a Thyroid Disorder of these 27 million people about half are undiagnosed. 37,000 new cases of Graves' disease are diagnosed each year in the US. 80% of all cases of Graves' disease are diagnosed in females. 20% of Thyroid Storm cases end in death. 80% of all Thyroid Disease cases are diagnosed as Hypothyroidism and 20% Hyperthyroidism. Females are 5 times more likely to develop a hypothyroid disease condition over males. 20% of people with Diabetes will experience an onset of a thyroid disorder. 50% of children with parents having a thyroid disorder may develop a thyroid disorder themselves by age 40. (Thyroidu.com). Again, Hyperthyroidism affects 2-5% of all women mainly between 20 and 40 years old. One study estimated the incidence to be 1-2 cases/1000 per year with women affected 10 times more often than men. (myVMC, 2013). Each year, about 2 - 5% of people with subclinical thyroid go on to develop overt hypothyroidism. Other factors associated with a higher risk of developing clinical hypothyroidism include being an older woman (up to 20% of women over age 60 have subclinical hypothyroidism), having a goiter (enlarged thyroid gland) or thyroid antibodies, or harboring immune factors that suggest an autoimmune condition.(University of Maryland Medical Center, 2013).

1.8.1 Some studies done on thyroid disordered patients in Australia, America, India & Bangladesh

1.8.1.1 Epidemiology of thyroid disorder in Australian population

Australian statistics pertaining specifically to hyperthyroidism are lacking. According to the 2007-08 national health survey,from Australian bureau of statistics, 64700 males and 421700 female experience thyroid dysfunction. But these studies do not differentiate between types of thyroid disorder, it is impossible to know what percent of these related to diagnosis of hyper thyroidism. According to the 1995 report from Australian bureau of statistics 5.3/1000 males and 27.3/1000 females experience hypothyroidism. (Hechtman L., 2011). Some another studies on Australian population for determining thyroid dysfunction:

1.5 Table: Australian prevalence of Hyper & Hypo Thyroidism (Thyroid flyer, 2000)

Australian Prevalence - Spontaneous Hypo- and Hyperthyroidism					
Age	**Female**		**Male**		**Female to Male**
	Number	**%**	**Number**	**%**	
20 & Under	16,065	0.60%	4,055	0.14%	3.96
21 to 30	26,891	1.91%	7,856	0.55%	3.42
31 to 40	50,631	3.46%	16,361	1.06%	3.30
41 to 50	83,833	6.28%	23,349	1.74%	3.59
51 to 60	107,289	11.25%	25,563	2.59%	4.20
61 to 70	136,747	19.30%	25,247	3.68%	5.41
71 to 80	166,344	29.22%	21,869	4.85%	7.61
Over 80	123,815	41.85%	9,504	6.26%	13.03
TOTALS	711,614	7.56%	132,831	1.43%	5.36

1.8.1.2 Epidemiology of thyroid disorder in American population

In United States hypothyroidism is the second most common endocrine disorder and it is estimated that, 18/1000 members of general population has decreased thyroid hormone level.4.6% of population have this problem. (clinical 0.3%, subclinical 4.3%). Along term 20 years study of hypothyroidism found 3.5 per 1000 wemen is annually affected by this disorder. Again, 1.3% of (clinical0.5%, subclinical 0.7%) population have suffering from hyperthyroidism. (Hechtman, 2011).

Prevalence of Thyroid disorders: 20 million Americans (NWHIC, 2008).

Prevalance Rate: approx 1 in 13 or 7.35% or 20 million people in USA.

Undiagnosed prevalence of Thyroid disorders: about 13 million (based on estimates from the AACE, as reported by Reader's Digest, estimated 8 million people (American Medical Women's Association, 2012).

Undiagnosed prevalence rate: approx 1 in 20 or 4.78% or 13 million people in USA.

Lifetime risk for Thyroid disorders: 1 in 8 women during their lifetime in the US (American Medical Women's Association); 1 in 8 for women (NWHIC, 2008).

1.8.1.3 Epidemiology of thyroid disorder in Indian population

The burden of thyroid disease in the general population is enormous. Thyroid disorders are the most common among all the endocrine diseases in India. In studies from western literature as many as 50% of people in the community have microscopic nodules, 3.5% have occult papillary carcinoma, 15% have palpable goitres, 10% demonstrate an abnormal thyroid-stimulating hormone level, and 5% of women have overt hypothyroidism or hyperthyroidism (Medicine Update, 2008)

1.8.1.4 Epidemiology of thyroid disorder in Bangladeshi population

Although there is no established data on the whole number of patients' suffering from thyroid dysfunction in Bangladesh, but it is can be assumed from some studies, which are

done on patients to assume the percentage of people suffering from thyroid disorder. A study shows that, Prevalence of sub-clinical hyperthyroidism and hypothyroidism was 6.5% and 15%, and prevalence of hyperprolactinemia was 43% and 21% in primary and secondary infertility respectively (Akhter and Hassan, 2008). Again a study shows- The overall occurrence of thyroid disease was estimated to be 20.43 %. The spectrum of thyroid disorders showed highest incidence of diffuse goitre (7.35 %), followed by sub-clinical hypothyroidism (6.59%), hypothyroidism (4.97%), hyperthyroidism (0.86%) and sub-clinical hyperthyroidism (0.65 %) (Paul *et.al*, 2006)

1.8.2 Prevalence of thyroid disorder is different country's people, according to the calculated population

Prevalence of thyroid disorder is different country's people, according to the calculated population, is given below. Although these results are not the exact data from these country health organigation.

1.6 Table: Prevalence of thyroid in different countries (Rightdiagnosis.com, 2012).

Country/Region	Prevalence	Population Estimated Used
Thyroid disorders in North America		
USA	21,592,308	293,655,405
Canada	2,390,284	32,507,874
Thyroid disorders in South America (Extrapolated Statistics)		
Brazil	13,536,845	184,101,109
Chile	1,163,526	15,823,957
Colombia	3,111,086	42,310,775
Paraguay	455,247	6,191,368
Peru	2,025,316	27,544,305
Venezuela	1,839,513	25,017,387
Thyroid disorders in Northern Europe (Extrapolated Statistics)		
Denmark	398,043	5,413,392
Sweden	660,764	8,986,400
Thyroid disorders in Western Europe (Extrapolated Statistics)		
Britain (United Kingdom)	4,431,669	60,270,708 for UK
Belgium	760,902	10,348,276
France	4,442,956	60,424,213
Thyroid disorders in Central Europe (Extrapolated Statistics)		
Austria	601,085	8,174,762

Czech Republic	91,630	1,0246,178
Germany	6,060,632	82,424,609
Thyroid disorders in Southern Europe (Extrapolated Statistics)		
Greece	782,906	10,647,529
Italy	4,268,932	58,057,477
Thyroid disorders in Eastern Asia (Extrapolated Statistics)		
China	95,503,499	1,298,847,624
Japan	9,362,720	127,333,002
North Korea	1,668,937	22,697,553
South Korea	3,546,599	48,233,760
Thyroid disorders in Southwestern Asia (Extrapolated Statistics)		
Turkey	5,065,729	68,893,918
Thyroid disorders in Southern Asia (Extrapolated Statistics)		
Afghanistan	2,096,593	28,513,677
Bangladesh	10,392,681	141,340,476
Bhutan	160,703	2,185,569
India	78,314,013	1,065,070,607
Pakistan	11,705,612	159,196,336
Sri Lanka	1,463,615	19,905,165
Thyroid disorders in the Middle East (Extrapolated Statistics)		
Gaza strip	97,425	1,324,991
Iran	4,963,470	67,503,205
Iraq	1,865,786	25,374,691
Israel	455,809	6,199,008
Jordan	412,588	5,611,202

Chapter 2
Literature Review

2 Literature Review

2.1 A Review of Literature on Sub-clinical hypothyroidism and hyperprolactinemia in infertile women: Bangladesh perspective after universal salt iodination

Hypothyroidism is an accepted cause of infertility and habitual abortion. We therefore evaluated the status of thyroid function and related hormones in infertile women in Bangladesh. Serum thyroid stimulating hormone and prolactin was measured in 113 infertile women during their first visit for infertility evaluation. Prevalence of sub-clinical hyperthyroidism and hypothyroidism was 6.5% and 15%, and prevalence of hyperprolactinemia was 43% and 21% in primary and secondary infertility respectively. Mean TSH level was higher in secondary infertility (3.6 +/- 3.7mIU/L) than primary infertility (2.3 +/- 2.7mIU/L), though the difference was not statistically significant (P < 0.11). Mean prolactin level in primary infertility (495 +/-340nmol/L) was higher than secondary infertility (340 +/- 310nmol/L), showing a significant statistical difference (p<.05). Prevalence of hyperprolactinemia was higher in primary infertility and prevalence of sub-clinical hypothyroidism was higher in secondary infertility, showing no correlation between TSH and prolactin levels in these two groups (Akhter and Hassan, 2008)

2.2 A Review of Literature on Cross Sectional Evaluation of Thyroid Hormone Levels in Non-diabetic and Diabetic Patients in Bangladeshi Population

Diabetes mellitus (DM) in many cases is found to be associated with disordered thyroid function. In this study 140 healthy non-diabetic subjects and 140 diabetic subjects were investigated for Fasting Blood Sugar (FBS), total triidothyronine (T3), total thyroxin (T4), free triidothyronine (FT3), free thyroxine (FT4) and thyroid stimulating hormone (TSH). Out of 140 diabetic subjects studied, 70% had euthyroidism (normal), 18.6% had hypothyroidism and 11.4% had hyperthyroidism. Serum T3, T4 and FT3 levels were low, TSH and FT4 levels were high in diabetic subjects whereas, in non-diabetic subjects all these levels were normal. All the diabetic subjects had high fasting blood sugar levels (10.82±2.72). Statically no significant differences were observed in serum T4 (p = 0.791) and BMI (p = 0.477) levels between non-diabetic and diabetic subjects. Fasting blood sugar was found to be significantly correlated with TSH, FT3 levels and others parameter

were not that much significant. In this study, 30% diabetic patients were found to abnormal thyroid hormone levels. The prevalence of thyroid disorder was higher in women (17.1%) than in men (12.9%), while hyperthyroidism were higher in males (13.3%) than in females (10%) and hypothyroidism was higher in females (20%) than in males (16.7%) (Alam J *et.al*, 2010).

2.3 A Review of Literature on A Comparative Study of Thyroid Hormone and Lipid Status of Patient with and without Diabetes in Adults

Lipid and thyroid function abnormalities are common in IDDM and NIDDM. Very few studies have addressed this issue in Bangladesh though Bangladeshi population is very much susceptible to patient with diabetes. To study on lipid profile and thyroid function in IDDM and NIDDM and the effect of glycemic control on it. This was a retrospective study carried out in the Dept. of Endocrinology, BIRDEM, Dhaka, Bangladesh during the period of January, 2012 to May, 2012. In this study, population consisted of 120 subjects (Age between 40 - 72 years; and Sex matched) divided into two groups: patient with diabetes 60 subjects (male-30, female-30) and patient without diabetes 60 subjects (male-30, female-30). Plasma glucose, HbA1c and serum lipids were measured by enzymatic method. Thyroid hormones were measured by a Chemiluminescent Micro particle Immunoassay (CMIA). The statistical significance was evaluated by Student's t-test, Correlation-Coefficient test. All Values are given as mean ± SD. The level of serum TSH in patient with diabetes (3.43 ± 2.71) was significantly ($p < 0.05$) increased compared to patient without diabetes subjects (1.98 ± 1.72). TSH levels were positively correlated with fasting plasma glucose ($r = 0.240$, $p < 0.05$), serum cholesterol ($r = 0.290$, $p < 0.020$) and triglyceride concentration ($r = 0.246$, $p < 0.05$). On the other hand, free T4 levels were inversely correlated with postprandial blood glucose ($r = -0.256$, $p < 0.046$). It may be concluded that the lipid and thyroid function abnormalities with others socio-demographic and biophysical risk factors were more common in patient with diabetes cases rather than patient without dia-betes cases. Therefore, further prospective studies with larger number of patients are required to strengthen the observa-tions of the present study (Saha*et.al*, 2013).

2.4 A Review of Literature on Prevalence of hypothyroidism in adults: An epidemiological study in eight cities of India

Hypothyroidism is believed to be a common health issue in India, as it is worldwide. However, there is a paucity of data on the prevalence of hypothyroidism in adult population of India. A cross-sectional, multi-center, epidemiological study was conducted in eight major cities (Bangalore, Chennai, Delhi, Goa, Mumbai, Hyderabad, Ahmedabad and Kolkata) of India to study the prevalence of hypothyroidism among adult population. Thyroid abnormalities were diagnosed on the basis of laboratory results (serum FT3, FT4 and Thyroid Stimulating Hormone [TSH]). Patients with history of hypothyroidism and receiving levothyroxine therapy or those with serum free T4 <0.89 ng/dl and TSH >5.50 μU/ml, were categorized as hypothyroid. The prevalence of self reported and undetected hypothyroidism, and anti-thyroid peroxidase (anti-TPO) antibody positivity was assessed. A total of 5376 adult male or non-pregnant female participants ≥18 years of age were enrolled, of which 5360 (mean age: 46 ± 14.68 years; 53.70% females) were evaluated. The overall prevalence of hypothyroidism was 10.95% (n = 587, 95% CI, 10.11-11.78) of which 7.48% (n = 401) patients self-reported the condition, whereas 3.47% (n = 186) were previously undetected. Inland cities showed a higher prevalence of hypothyroidism as compared to coastal cities. A significantly higher (P < 0.05) proportion of females vs. males (15.86% vs 5.02%) and older vs. younger (13.11% vs 7.53%), adults were diagnosed with hypothyroidism. Additionally, 8.02% (n = 430) patients were diagnosed to have subclinical hypothyroidism (normal serum free T4 and TSH >5.50 μIU/ml). Anti – TPO antibodies suggesting autoimmunity were detected in 21.85% (n = 1171) patients. The prevalence of hypothyroidism was high, affecting approximately one in 10 adults in the study population. Female gender and older age were found to have significant association with hypothyroidism. Subclinical hypothyroidism and anti-TPO antibody positivity were the other common observations (Unnikrishnan.*et al,* 2011)

2.5 A Review on Hyperthyroidism: Thyrotoxicosis under Surveillance

Thyrotoxicosis exhibit collective clinical manifestation, caused by excessive serum thyroid hormones particularity thyroxin. The clinical signs and symptoms included general alteration of metabolic process leading to weight loss fatigue and weakness and some specific disorders such as cardiovascular, neuromuscular reproductive gastrointestinal dermatological and bone disorders. The diagnosis of thyrotoxicosis relay

on the thyroid function test carried out by the laboratory serum measurement of thyroxin, triidothyronin and thyroid stimulating hormones accompanied by other para-medical examinations suggested by clinicians and endocrinologist. In thyrotoxicosis serum level of thyroid hormones and thyroxin in particular elevated accompanied by pituitary thyroid stimulating hormone suppression reaching to undetectable level in sever thyrotoxicosis. Among the most common cause of thyrotoxicosis are, thyroid autoimmunity diseases thyroid toxic, adenoma toxic nodular and multinodular hyperthyroidism. The main aim behind this review is to explore the clinical manifestation, the causative factors, diagnosis, metabolic disorder occur due to thyrotoxicosication (Mansourian, 2010).

2.6 A Review on Post-Puberty Hypothyroidism: A Glance at Myxedema

Hypothyroidism, is a thyroid disorder accompanied by serum thyroid hormone reduction when thyroxin T4, the main thyroid hormone, reduced, it is followed by disruption of a negative-feed back auto regulatory mechanism on pituitary gland and subsequent thyroid stimulating hormone (TSH) which is released into the blood circulation to stimulate the thyroid gland to produce enough thyroid hormone to compensate for the body hormone requirements. Therefore, reduced serum thyroxin(T4) in principle, triidothyronine (T3) and elevated TSH are laboratory indices for the diagnosis of hypothyroidism. At early stage of hypothyroidism although laboratory measurements of thyroid function test are manifest the thyroid disorder but the patient clinical signs and symptoms may remain unnoticed. If the patient undiagnosed and untreated the condition of hypothyroidism worsen and the clinical manifestation begin to show itself and myxedema is a definition given to the whole picture of untreated hypothyroidism at very end stage the patients enter into myxedema comma with eventual death due to the sever symptoms of hypothyroidism. Among important causative factors leading to catastrophic events in myxedema is life threatening hypothermia, heart and cerebral dysfunctions (Mounsourian, 2010).

2.7 A Review of Literature on Thyroid Function Tests During First-trimester of Pregnancy

This literature review was conducted to summarize the main points of maternal thyroid function tests, with particular attention in the first trimester of pregnancy which accompanied with significant biochemical and metabolic alteration. The evaluation of

thyroid function of either hyperthyroidism or hypothyroidism should be assessed by determination of serum Thyroid Stimulating Hormone (TSH), Thyroxine (T4), Triiodothyronine (T3), Iodine and Thyroid Autoantibodies. Glomerular filtration rate is increased during pregnancy; therefor iodine deficiency should be evaluated during the pregnancy to prevent hypothyroidism. The role which can be played by Human Chronic Gonadotropin (hCG) on stimulating the thyroid gland to become over-active was investigated. Serum level of thyroglobulin (Tg) and Thyroxin Binding Globulin (TBG) should be assessed for proper assessments of thyroid gland during pregnancy. Thyroid function tests during first-trimester of pregnancy and particularly the reference interval for thyroid function tests for pregnant women in each region has to be established, to prevent misdiagnosis and irreversible mental and physical adverse effect for growing fetus (Mansourian ,2010).

2.8 A Review of Literature on Female Reproduction Physiology Adversely Manipulated by Thyroid Disorders

Proper thyroid function is vital to have a healthy reproduction system. Female sex hormones are altered due to hypothyroidism and hyperthyroidism. Female reproduction system is negatively manipulated by both hyperthyroidism and hypothyroidism and menstrual disorders are the ultimate concequences. Hypomenorrhea, polymenorrhea and oligomenorrhea are the clinical manifestation associated with hyperthyroidism and hypothyroidism, respectively. The female infertility is also adversely affected by thyrotoxicosis and myxedema, the clinical presentation of hyper and hypothyroidism. The simultaneous existence of autoimmunity which is present among some portion of pregnant women may aggravate the clinical manifestation of thyroid disorders in female reproductive physiology. Abortion, premature infants, low birth infant, are among clinical presentation of overt hypothyroidism. Auto antibody against thyroid stimulating hormone receptor and eventual hyperthyroidism considered as risk factors which require extra attention while the thyroid disorder is clinically managed during pregnancy to prevent the fetus from abnormal metabolism. The aim of this review is to elaborate the adverse role of hyperthyroidism and hypothyroidism in female reproduction physiology (Mansourian, 2010).

2.9 A Review of Literature on the State of Serum Lipids Profiles in Sub-Clinical Hypothyroidism

Thyroid disorders usually associated with lipid abnormalities. Overt hypothyroidism is a state with thyroid hormone deficiency. Sub clinical hypothyroidism is defined as condition, in which thyroid stimulating hormone concentration elevated when serum thyroid hormones are at normal levels. Whether sub-clinical hypothyroidism associated with lipid alteration, it is the main concept behind this study. Although, in this study, we found cases with normal thyroxin and elevated thyroid stimulating hormone are common, but whether the sub-clinical hypothyroidism finally converted to overt hypothyroidism are not universally accepted. The findings also indicated subjects with sub-clinical hypothyroidism usually are accompanied with dyslipidemia and in general the total cholesterol level is higher among sub-clinical hypothyroid patients, with eventual risk of arthrosclerosis. This study indicated that there is not a common findings to support the benefit of thyroxin therapy in sub-clinical hypothyroidism. It is concluded that it seems sub-clinical hypothyroidism is a common thyroid abnormality which can be diagnosed by the medical diagnostic laboratory through thyroid function test and it is mainly accompanied with lipid disorder (Mansourian, 2010).

2.10 A Review of Literature on Prevalence of thyroid disease, thyroid dysfunction and thyroid peroxidase antibodies in a large, unselected population. The Health Study of Nord-Trùndelag (HUNT):

It is done to examine the prevalence of thyroid disease and dysfunction including thyroid autoimmunity in Norway. All inhabitants 20 years and older (94 009) in Nord-Trùndelag were invited to participate in a health survey with a questionnaire and blood samples. The prevalence of former diagnosed hyperthyroidism was 2.5% in females and 0.6% in males, hypothyroidism 4.8% and 0.9%, and goitre 2.9% and 0.4% respectively. In both sexes the prevalence increased with age. In individuals without a history of thyroid disease the median, 2.5 and 97.5 percentiles for TSH (mU/l) were 1.80 and 0.49±5.70 for females and 1.50 and 0.56±4.60 for males. The TSH values increased with age. When excluding individuals with positive thyroid peroxidase antibodies (TPOAb) (> 200 U/ml), the 97.5 percentiles dropped to 3.60 mU/l and 3.40 mU/l respectively. The prevalence of pathological TSH values in females and males were TSH$10 mU/l 0.90% and 0.37%; TSH 4.1±9.9 mU/l 5.1% and 3.7%; and TSH#0.05 mU/l 0.45% and 0.20% respectively.

The prevalence of positive TPOAb (> 200U/ml) was 13.9% in females and 2.8% in males. In females the lowest percentage (7.9%) of positive TPOAb was seen with TSH 0.2± 1.9 mU/l and increased both with lower and higher levels of TSH. The percentage of males with positive TPOAb was lower than in females in all TSH groups except for those with TSH> 10 mU/l (85% TPOAb positive). In spite of a high prevalence of recognised thyroid disease in the population a considerable number of inhabitants have undiagnosed thyroid dysfunction and also positive TPOAb(Bjùro*et al.*,2000).

2.11 A Review of Literature on Congenital Hypothyroidism in the Southern Bangladesh:

Congenital hypothyroidism is the commonest preventable cause of mental retardation. It is more prevalent in endemic goiter regions like Bangladesh. But magnitude of the problem has not been studied at national level. This study was done to detect the frequency of congenital hypothyroidism in southem part of Bangladesh & to develop neonatal screening program. All the living newborns delivered between Oct 01 to June 05 Khulna Medical College Hospital were included in the study, After taking the relevant information from mother, cord blood sample were collected from the newborn within 120 hours of birth and kept in freezer. At the end of collection of each two months, the lot was sent to the laboratory of Institute of Nuclear Medicine, Dhaka for radioimmunoassay of TSH. Potential cases with TSH above 10 MIU were recalled for thyroid function test for confirmation of diagnosis. Fifteen hundred samples were collected in total during 45 months of study. One forty seven unsatisfactory samples were discarded; thereby 1353 samples were eventually assayed for TSH. Among the study population 88.2% hailed from Khulna district and the rest of the cases came from neighboring districts. Male to female baby ratio was 1.2:1. Regarding the birth weight 33.4% babies were low birth weight. TSH above 10 was found in 35 babies among whom one baby was hypothyroid and the other member of the twin was also hypothyroid although the TSH level was below 10. None of newborn had TSH level above 20. Thus frequency of congenital hypothyroidism was 1.5 per thousand living newborn. Congenital hypothyroidism in southern part of the country is quite high in relation to global incidence. Although this is not the national picture but the high figure is alarming. Therefore neonatal screening program should be implemented as soon as possible to reduce the number of mentally retarded child (Rasul*et.al* , 2010).

2.12 A Review of Literature on Thyroid Disorders in Khulna District: A Community Based Study:

This study reports the prevalence of thyroid diseases and their relationship to autoimmunity in a population of Khulna district where goitre is not endemic. A survey was performed among citizens of a union of Khulna district. The study population consisted of a random sample of the students of primary schools, secondary schools and people of nearby areas. History taking, neck examination for goitre and blood examination for thyroid hormones was done from each subject. Blood sample was measured for thyroid hormones and thyroid microsomal antibody (TMAb) using radioimmunoassay method. Of the total 925 individual studied, 527 was female and 398 was male with age ranges from 2-62 years (mean 19.86::!:13.62 years). The overall occurrence of thyroid disease was estimated to be 20.43 %. The spectrum of thyroid disorders showed highest incidence of diffuse goitre (7.35 %), followed by sub-clinical hypothyroidism (6.59%), hypothyroidism (4.97%), hyperthyroidism (0.86%) and sub-clinical hyperthyroidism (0.65 %). The incidence of thyroid disorders was observed to be highest in the 11-45 years age group (79.89%). Female outnumbered male, the ratio being 2.5: 1 with preponderance offemale subjects in all disease groups. The prevalence of all goitre was 10.49%. TMAb estimation was performed in 318 samples, of them 48 cases (l5.09%) was found to be autoimmune thyroid disease. Of the total sub-clinical and overt hypothyroidism, the incidence of autoimmune thyroid disease was 29.29% and non-goitrous thyroid dysfunction was more common than goitrous one. Three of 38(7.89%) euthyroidgoitrous subjects showed positive antibody. Interestingly, 16 of 181(8.84%) individual had a positive antibody, which was considered normal by neck examination. Goitre prevalence of 10.49% in this study indicates the region to be a mild iodine deficient area. Chronic autoimmune disease is likely to be one of the etiological factors for thyroid disorders in this southern zone (Paul *et.al,* 2006).

2.13 A Review of Literature on The ratio of serum free triiodothyronine to free thyroxine in children: a retrospective database survey of healthy short individuals and patients with severe thyroid hypoplasia or central hypothyroidism

The ratio of serum free triiodothyronine (FT3) to free thyroxine (FT4) has been shown to be constant in healthy adults. However, this ratio has been found to be decreased in athyreotic adult patients on levothyroxine (L-T4) supplementation. A reference range for

the FT3/FT4 ratio was obtained from 129 Japanese children (3–17 y) with idiopathic short stature who were designated as the 'Control' group. Patients with congenital hypothyroidism due to athyreosis or severe thyroid hypoplasia (designated as 'A/Hypoplasia'), as well as patients with central hypothyroidism ('Central'), were recruited from the institutional database. For each group, the mean FT3/FT4 ratio was obtained. In the Control group, the FT3/FT4 ratio was 3.03 ± 0.38 10 −2 pg/ng (mean ± standard deviation) with no age or gender differences. A/Hypoplasia patients showed a significantly decreased mean FT3/FT4 ratio (2.17 ± 0.33, P < 0.001) compared to Control patients, with decreased FT3 and elevated FT4 levels. The Central group also showed a significantly decreased FT3/FT4 ratio (2.55 ± 0.45, P < 0.001) compared to the Control group, with decreased FT3 and equivalent FT4 levels (Oto . *et al*, 2011).

2.14 A Review of Literature on Assessment of hyperthyroidism and hypothyroidism in adult patients

Generally sub-clinical hypothyroidism and hyperthyroidism are diagnosed on the basis of laboratory evaluation and mostly such patients' manifest with mild or devoid of any clinical signs or symptoms. It is known to be a common disorder, also refer to as sub-clinical thyroid disease particularly in middle-aged and elderly individuals. Moreover, it is reported that most patients who were found to have sub-clinical hyperthyroidism, depicts TSH values between 0.1 to 0.45 μIU/L and those with sub clinical hypothyroidism between 4.5 to 10 μIU/L. In this respect, studies were carried out during January 2006-Dec 2007 in 230 adult patients (98 males, 132 females) for evaluation of sub-clinical thyroid disease. TSH and thyroid hormones (T3 T4, FT3 and FT4) levels of all patients were determined by standard methods to assess the extent of the sub-clinical status. In female group which comprised of 132 patients, a total of n = 28 (21.20%) exhibited sub-clinical thyroid disorders [n = 18; 13.63% Sub-clinical hypothyroidism, n = 10; 7.57% sub-clinical hyperthyroidism], whereas 59 (44.69%) exhibited true-thyroid disorder. Subsequent assessment in males shows that out of 98 patients; n = 15 patients (15.30%) showed sub-clinical thyroid disorders [n = 9; 9.18% sub-clinical hypothyroidism; n = 6; 6.12% sub-clinical hyperthyroidism], whereas 20 (20.40%) exhibited true thyroid disorder. In both gender groups, 45 and 63 individuals were without any sub-clinical or true thyroid disease, respectively and thus presented as

normal. It is concluded that sub-clinical thyroid dysfunction prevails in females with 12.17% occurrence whereas 6.52% in males. Furthermore, the evaluation and subsequent presence of sub-clinical conditions predicts future progression to overt disease. Through review of existing literature and reports, it is also advisable that routine screening for thyroid disease through clinical investigations aided with lab findings be promoted, especially in pregnant women (Sultana *et al*, 2010).

2.15 A Review of Literature on Assessment of Thyroid Disorder in Far Western Part of Nepal: A Hospital Based Study

This study was conducted to know the status of thyroid disorder in people of far western region of Nepal. A total of 808 cases, out of which 133 male and 675 female were included and study was carried out using data retrieved from the register maintained in the Department of Biochemistry of the Nepalgunj Teaching Hospital, Kohalpur, Banke, Nepal, between 1st January, 2011 and 28th February, 2012. The variables collected were age, sex, and thyroid function profile including free T3, free T4 and TSH. The data was analyzed using Excel 2003, R 2.8.0 Statistical Package for the Social Sciences (SPSS) for Windows Version 16.0 (SPSS Inc; Chicago, IL, USA) and the EPI Info 3.5.1 Windows Version. The percentage of thyroid disorders was 33.66% in people of far western region of Nepal. The people were highly affected by overt hyperthyroidism (14.9%) followed by subclinical hyperthyroidism (9.9%). The subclinical hypothyroidism was 7.9% while 1% overt hypothyroidism only. Serum fT3, fT4 and TSH level were significantly different in male and females. Similarly, fT3, fT4 and TSH levels show statistically significant differences in different thyroid disorders. The fT3 and fT4 level in overt hyperthyroidism and subclinical hypothyroidism showed statistically significant differences when compared with euthyroidism group. Likewise, TSH level also shows statistically significant in all the thyroid disorders when compared with euthyroidism group. The fT3 and fT4 levels were statistically insignificant in all the age groups whereas TSH level showed statistically significant different in all the age groups. The fT3 and fT4 level in 21-40 years showed statistically significant when compared with serum level of fT3 and fT4 of 0-20 years. Similarly, serum level of TSH in 21-40 and 41-60 years also showed statistically significant when compared with serum level of TSH of 0-20 years. The people residing in far western region have risk for thyroid disorders. They were suffering with thyroid disorder, especially overt hyperthyroidism (14.9%) and subclinical

hyperthyroidism (9.9%). Further studies are required to characterize the reasons for this high prevalence of overt hyperthyroidism and subclinical hyperthyroidism (Yadav *et al*, 2012).

2.16 A Review of Literature on Pattern of hypothyroid cases in Bangladeshi People: A pilot study

The present study was undertaken to explore the pathological basis of hypothyroidism and it relationship to clino-biochemical features of Bangladeshi patients. A total number of 47 hypothyroid patients with duration less than two years and had no other comorbid disease were consecutively recruited from BIRDEM Out-patient department. Patients having serum FT4 level <9.14 pmol/L and serum TSH >5.01 IU/ml were identified as hypothyroidism. Presence of either anti TG antibody >40 IU/ml or anti TPO antibody > 35 IU/ml or both were defined as autoimmune hypothyroidism. Thyroid gland was examined and classified according to joint criteria of WHO, UNICEF and ICCIDD criteria. Female preponderance was observed in this series though small total number of samples. Familial hypothyroidism was reported in 19% of cases and 8% of patients came from iodine deficient area. Out of 47 cases autoimmune markers were done in 40 and of them 32 (68%) were positive for autoantibodies. Of the positive case 22% were positive for anti TPO antibody and 6% for anti TG antibody; 72% cases both. Drug and radiation were exclude as the cause of hypothyroidism in this series. Family history of hypothyroidism was positive in 22% and 25% autoimmune and non-autoimmune study cases. Of the autoimmune case 44% had age between 30-44 years and among non-autoimmune case 37% were 15-30 years. Eleven of 32 (34%) autoimmune hypothyroid cases presented with irregular menstrual cycle. Out of 47 hypothyroid patients in this study, 36 (77%) had palpable or enlarged thyroid gland. Of the 40 cases autoimmune status evaluated palpable among 25 (78%) autoimmune and 6 (75%) non-autoimmune hypothyroid patients. It is concluded that higher proportion of hypothyroid cases are of autoantibody positive. These subjects have heterogeneous phenotypic presentation. This necessitates that all newly detected hypothyroidism should be screened for autoimmune status with the same importance as given for thyroid hormone level and managed accordingly (Islam. *et al*., 2013).

Significance of the study

Thyroid disorder is the second most common endocrine disorder in women both in the developed and less developed world (Hechtman, 2011). It is estimated that 200 million worldwide have a Thyroid Disorder of these 27 million people about half are undiagnosed.Females are 5 times more likely to develop a hypothyroid disease condition over males. 20% of people with Diabetes will experience an onset of a thyroid disorder. 50% of children with parents having a thyroid disorder may develop a thyroid disorder themselves by age 40. (Thyroidu.com). Again, Hyperthyroidism affects 2-5% of all women mainly between 20 and 40 years old. One study estimated the incidence to be 1-2 cases/1000 per year with women affected 10 times more often than men. (myVMC, 2014). Each year, about 2 - 5% of people with subclinical thyroid go on to develop overt hypothyroidism.(University of Maryland Medical Center, 2014). Thyroid disorder is now the most common disease among men and women in Bangladesh. It is guessed that, more than 10,392,681 people having any kind of thyroid disorder. Among them more than half of the population is being unaware about this disease. . Because of their unawareness these patients may suffered from goiter, thyrotoxicosis, thyroid cancer and thyroid papillary carcinoma, gravies disease, etc. As this disease does not have such significant signs and symptoms generally no one can understand that. But this disease is a slow killer which may further develop many other physical and mental problems. Sometimes hyper or hypo thyroidism may lead to thyroid carcinomas and may cause death. Hyper and hypo thyroidism is very crucial in female fertility. Most of the persons having thyroid disorder is female and the patient's aged between 25-40 may be infertile due to some thyroid disorders. Although there is not any specific statistical calculation of government in our country, but some studies which are done on some diagnosed patients like that - 113 infertile women during their first visit for infertility evaluation. Prevalence of sub-clinical hyperthyroidism and hypothyroidism was 6.5% and 15%, and prevalence of hyperprolactinemia was 43% and 21% in primary and secondary infertility respectively (Akhter N. and Hassan S., 2008). From a study donebetween March and August 2014, indicates that, Females were found with higher rate of thyroid dysfunction (78.3%) with male (21.7%) (Moslem F. *et.al,* 2015). So, we can see that, a high percentage of female are suffering from this disorder. Lack of awareness and early detection program in developing country is a main reason for escalating the morbidity.

The study done in Bangladesh on thyroid disordered patients' prevalence level checking is very few. There is no study focusing on hyperthyroidism and hypothyroidism. But is difficult to calculate the prevalence on the general people, so we have the diagnosed patients to conduct our study and our target was to judge the level of knowledge about thyroid dysfunction, early warning signs, and therapeutic and screening approaches.

Because, if we do the study on them, we will get idea what is there knowledge level about thyroid disorder (hyperthyroidism and hypothyroidism), risk factors and their treatment pattern and how much they are complying with their medication and treatment pattern.

We are serving this study as, these two diseases can lead to severe infertility problem to both male and female. These may also causes CNS problem, cardiovascular problem, integumentary and various ENT problems. So, we can say these are vital reason for many diseases but as most of the people do not notice this as a reason for their sufferings, they do not take treatment and this hormonal disease may hamper their physical conditions a lot. Again, as it is a hormonal disorder, the patient's must be conscious and consistence about their treatment and medication. From this study, we can calculate their conditions whether their hormone levels are in control by taking medications or relapse occurred when they stopped their treatment.

From this study we will also get idea about their family history of thyroid disorder or any other endocrine disorder and the relationship with the patient. But we can estimate the approximate number of patients who have been diagnosed and how much the aware about this disease, how they are treated, and their willingness and also awareness to control their hormone level.

Study Goal and Objective:

- To examine the prevalence of hyperthyroidism and hypothyroidism in Bangladeshi patients

- The symptoms, diagnosis, treatment pattern, and medication of both hypothyroidism and hyperthyroidism.

- Awareness among the patients regarding their disease.

Chapter 3
Study Method

3 Study method

3.1Study area

Permissions were taken from the authorized members of the following hospitals before interview.

- The Institute of Nuclear Medicine & Ultrasound (INMU) Bangabandhu Sheikh Mujib Medical University (BSMMU), Shahbagh , Dhaka-1000
- Central Hospital Ltd, 18,Green Road, Dhaka-1205
- Thyroid Clinic, 20, Green Road, Dhaka-1205
- BITMIR, 19, Green Road, Dhaka-1205
- Popular Diagnostic Centre, House # 16, Road # 2, Dhanmondi R/A, Dhaka – 1205
- BIRDEM (Bangladesh Institute of Research and Rehabilitation in Diabetes, Endocrine and Metabolic Disorders) 122,Kazi Nazrul Islam Avenue, Shahbagh,Dhaka 1000

3.2 Total Number of participants

Data was collected from 402 endocrine disordered patients.

3.3 Inclusion criteria

- All patients having endocrine disorder and who are previously diagnosed.
- Participants always included a general population of both sexes without age restriction.
- Patients having incidence of endocrine dysfunction but specially focused on both hypo- and hyperthyroidism patients.

3.4 Exclusion Criteria

- Unwilling to participate or unable to comply with protocol requirements.

3.5 Procedure

- For collecting data, a questionnaire was prepared according to required information.

- The collected data were analyzed with the help of Microsoft Office Excel and filtered out accordingly for analysis. Some graphical representations were made from those analysis statuses.

Chapter 4
Result

4 Result

4.1 Participants having endocrine disorder

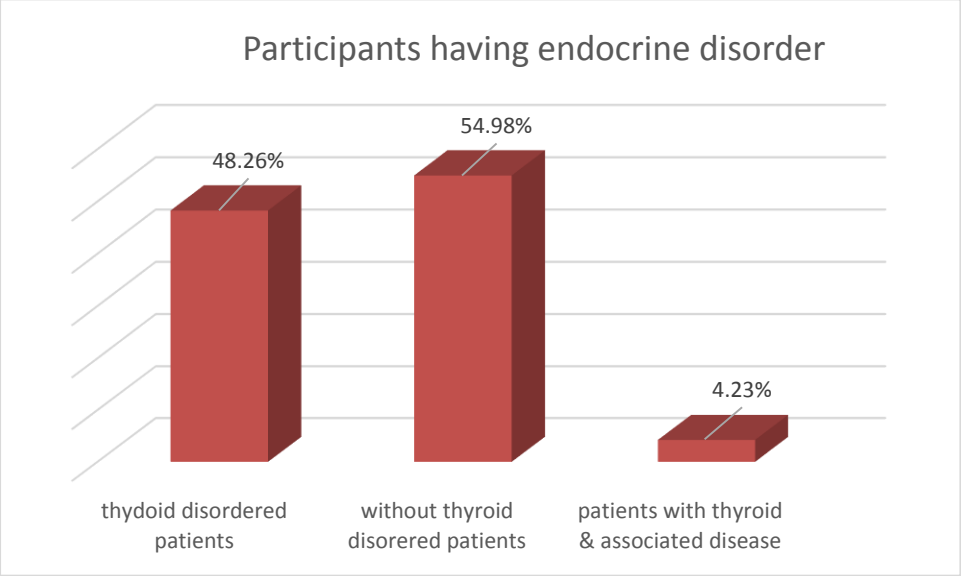


Fig 4.1 Participants having endocrine disorder

Among 402 endocrine disordered patients 48.26% patients having thyroid disorder and 54.98% patients having other endocrine disorders, like glucose homeostasis disorder, diabetes, sex hormone disorder or tumor of endocrine gland and 4.23% patients having thyroid and other associated diseases.

4.2 Percent of participating population suffering from various endocrine disease

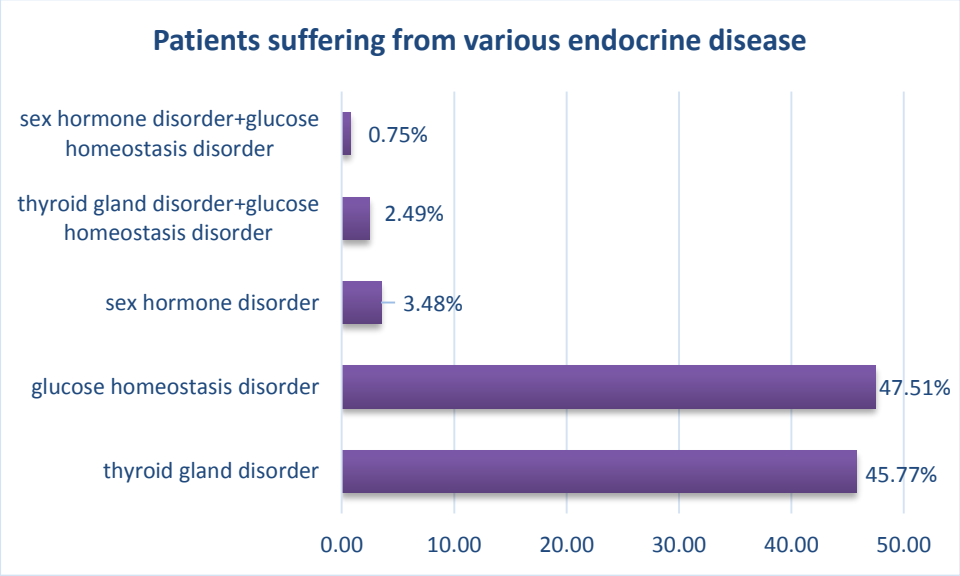


Fig 4.2 Patients suffering from various endocrine disease

Among 402 respondent there are 45.51% having thyroid disorder, 47.51% having glucose homeostasis disorder, especially diabetes and 3.48% having sex hormone disorder,2.49% having thyroid and other glucose homeostasis disorder, 0.75% have sex hormone disorder and glucose homeostasis disorder.

4.3 Age of Patients having thyroid disorder

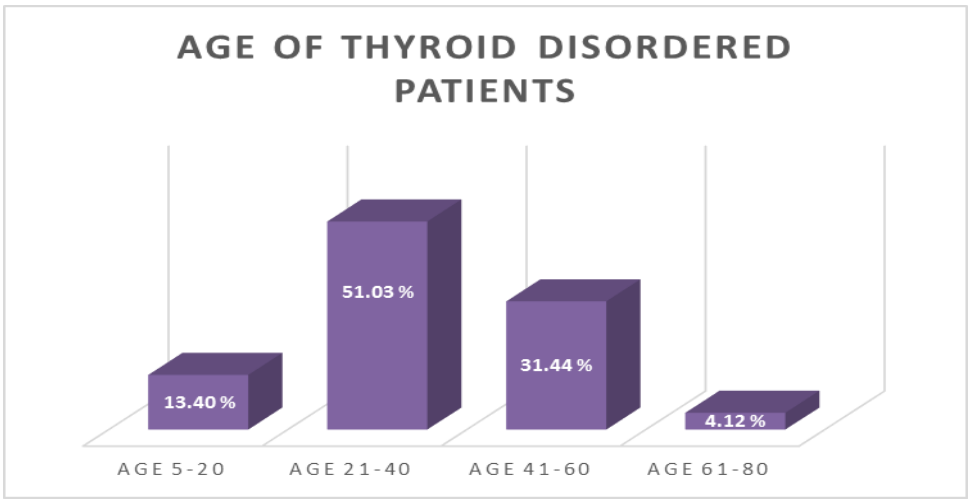


Fig 4.3 Age distribution among thyroid disordered patients

Among 194 patients , majority of them are in the age limit 21-40 (51.03%), then age 41-60 are of 31.44% then age 5-20 years are of 13.40% and rest of patients are of age 61-80 years having 4.12%.

4.4 Sex of thyroid disordered patients

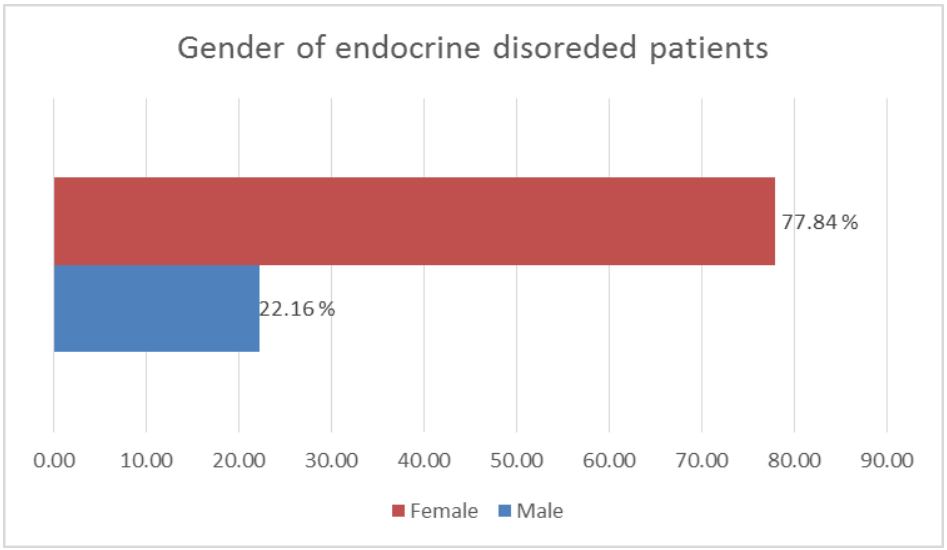


Fig 4.4 Gender of patients

Among 194 patients suffering from thyroid disorder, majority 77.84% are female and only 22.16% are male.

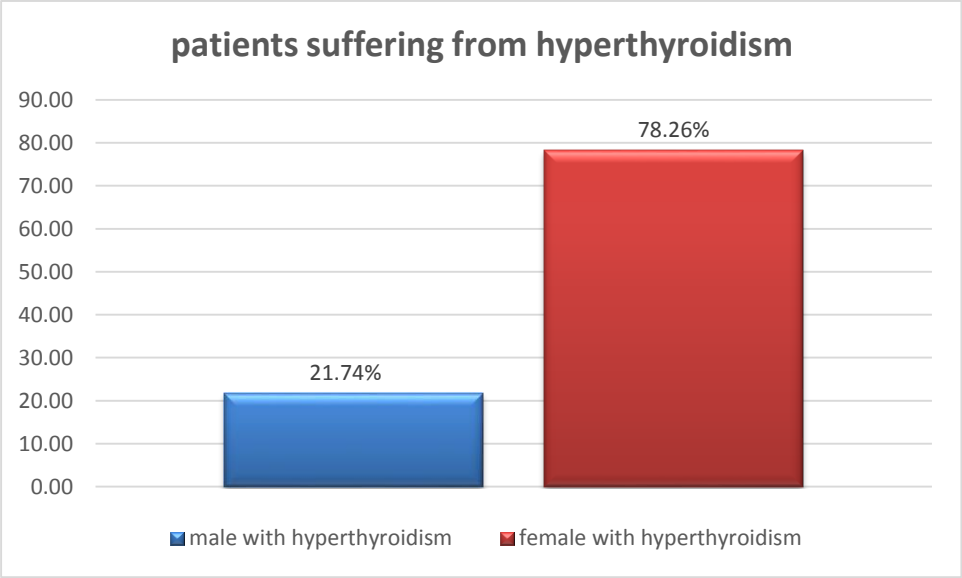


Fig 4.4.1 Male and female patient having hyperthyroidism

Among 194 patients 92 patients having hyperthyroidism, 78.26% are female and only 21.74% are male.

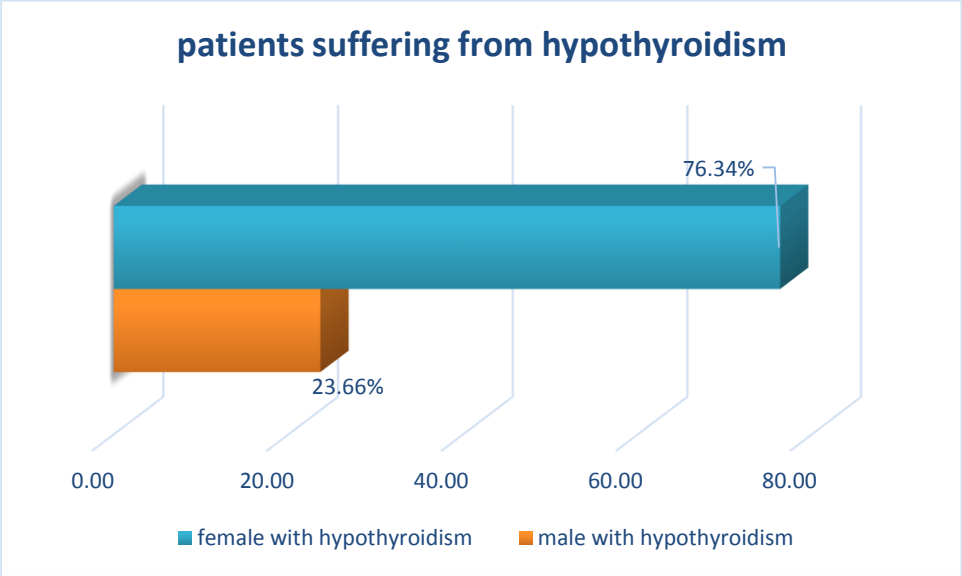


Fig 4.4.2 Male and female patient having hypothyroidism

Among 194 patients 93 patients are suffering from Hypothyroidism, 23.66% are male and 76.34% are female.

4.5 Marital status of patients

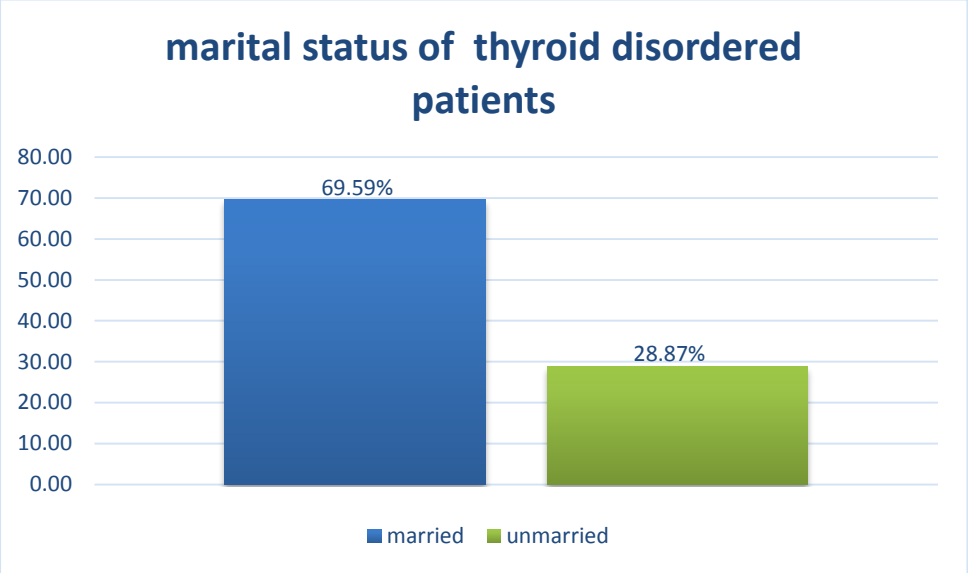


Fig 4.5 Marital status of thyroid disordered patients

Among 194 patients having thyroid disorder, 69.59% are married and 28.87% are unmarried.

4.6 Education level of patients

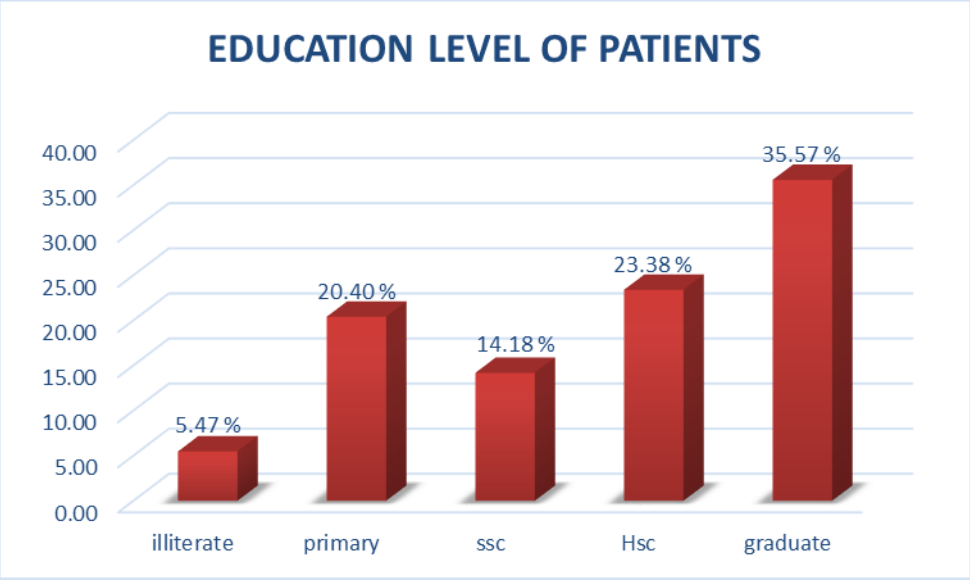


Fig 4.6 Education level of patients

Among 402 patients 398patients can given their data and according to that, 5.47% are illiterate, 20.40% have primary education, 14.18% passed SSC and 23.38% have their HSC and 35.57% patients are Graduates.

4.7 Occupational status of patients

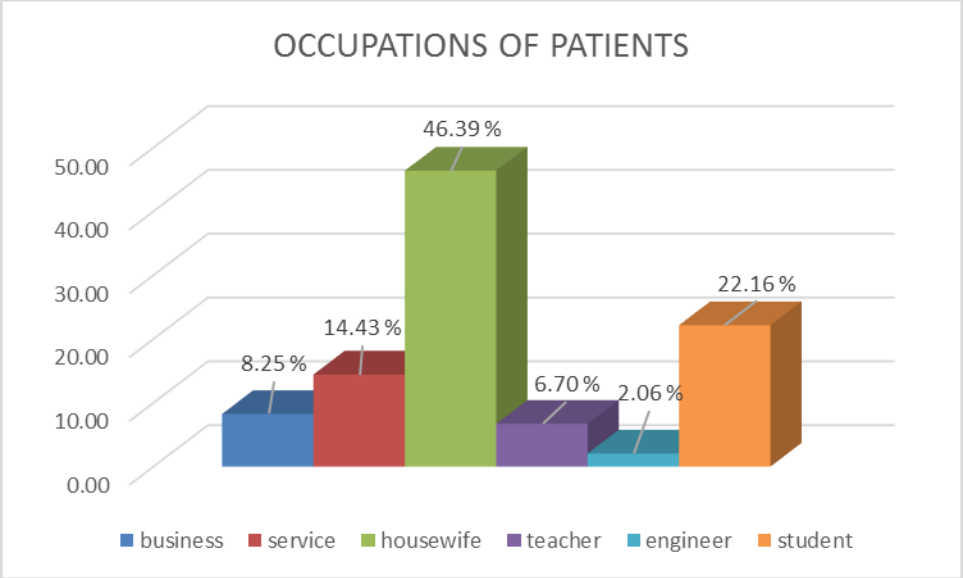


Fig 4.7 Occupational status of patients

Among them, majority 46.39% are housewife, then 22.16% are students, 14.43% are service holder, 8.25% doing business, 6.70% are teacher and 2.06% are engineer.

4.8 BMI status of Hyperthyroid containing patients

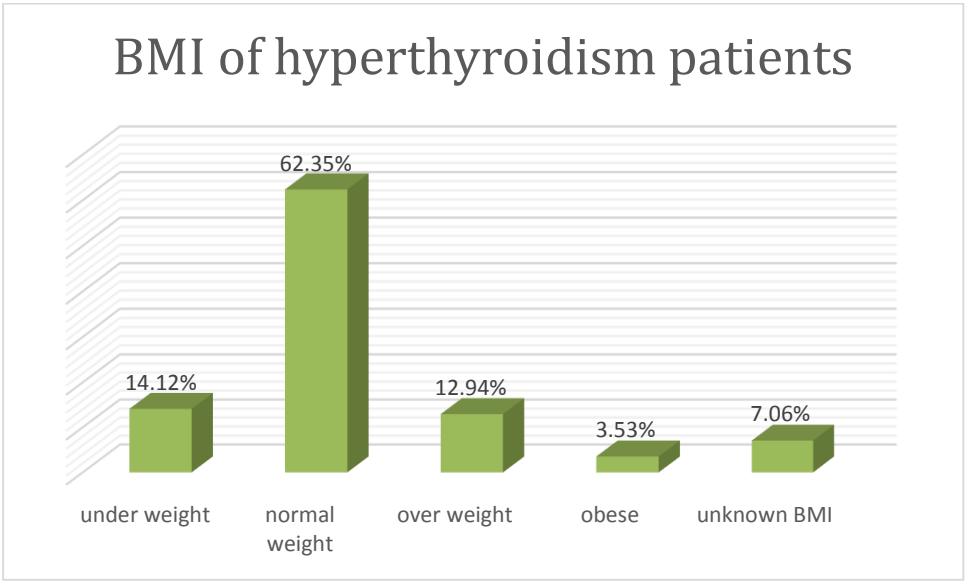


Fig 4.8 BMI status of Hyperthyroid containing patients

According to BMI standard < 18.5 are underweight, 18-24.5 are normal weight, 25-29.9 are overweight, and obese are >30.

Here, patients with Hyperthyroidism are 14.12%underweight, 62.35% are normal weighted, 12.94% are of overweight, 3.53 are obese and 7.06% don't know their BMI status.

4.9 BMI status of Hypothyroid containing patients

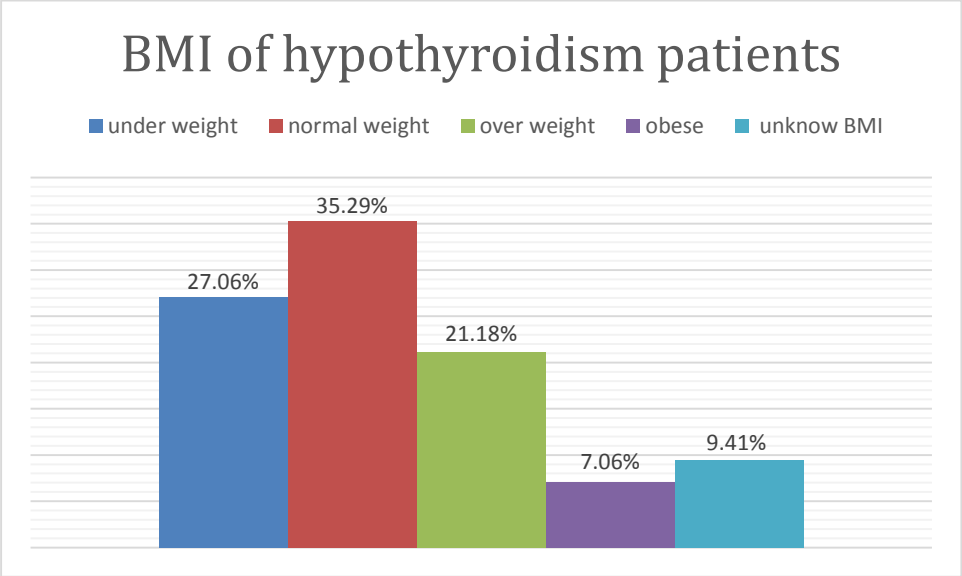


Fig 4.9 BMI status of Hypothyroid containing patients

According to BMI standard < 18.5 are underweight, 18-24.5 are normal weight, 25-29.9 are overweight, and obese are >30.

Here, 27.06% patients are underweight, 35.29 %are normal, 21.18% are overweight, 7.06% are obese and 9.41% do not know their BMI status of all 85 participant patients.

4.10 Types of thyroid disorder

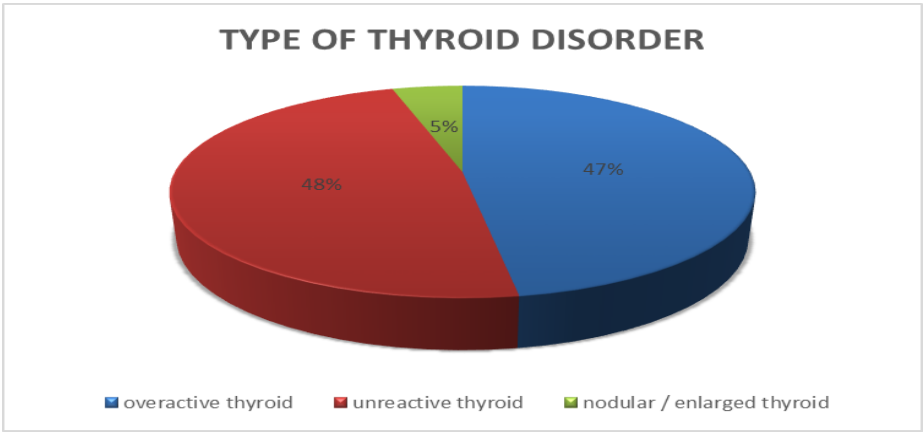


Fig4.10 Types of thyroid disorder

Among 194 patients having thyroid disorder, of them 48% are having unreactive thyroid (Hypothyroidism), 47% having overactive thyroid (Hyperthyroidism) and 5% have nodular or enlarged thyroid gland.

4.11 History of Thyroid disorder

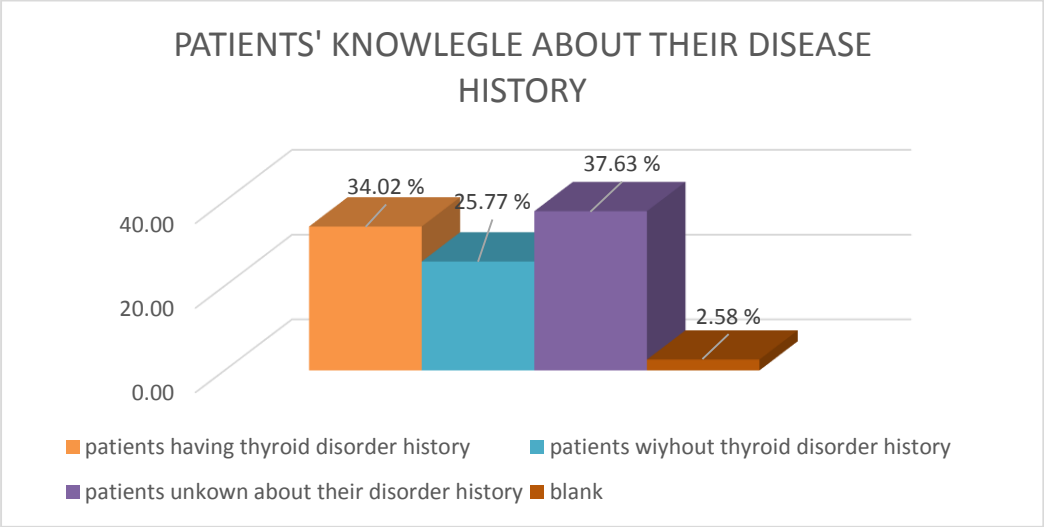


Fig 4.11 History of Thyroid disorder in patients.

Among all patients 34.02% have their family history, 40.21% do not know the reason and past family history, 26% patients said they do not have any family history of this disease, although they were not very confident.

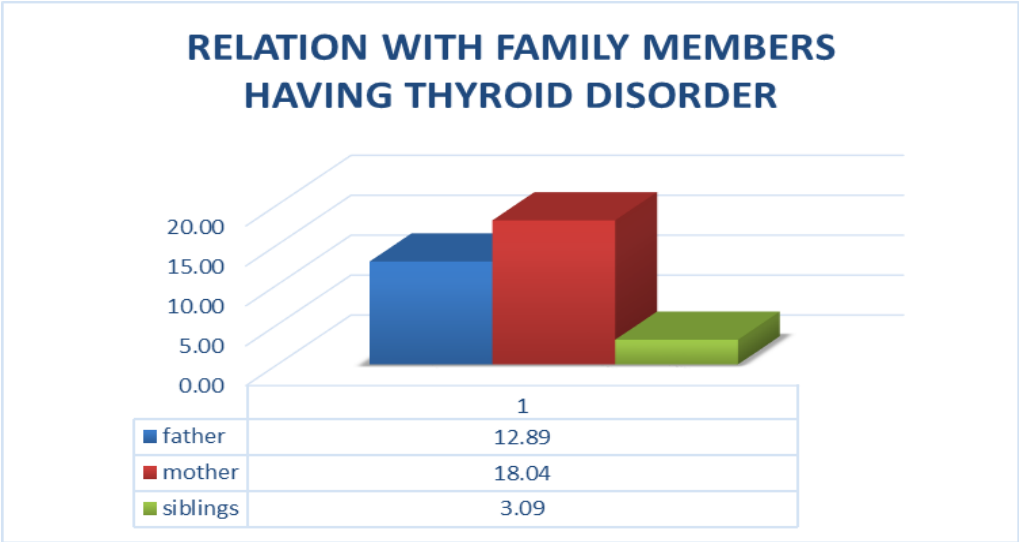


Fig 4.11.1 relation of patients with their family members having thyroid disorder.

Among the 34% patients who have family histories, 18.04% got their disease from their mother, 12.89% got their disease from their father, and 3.09% having this disorder as their siblings are also suffering from it.

4.12 Types of Hyper and Hypothyroidism among patients

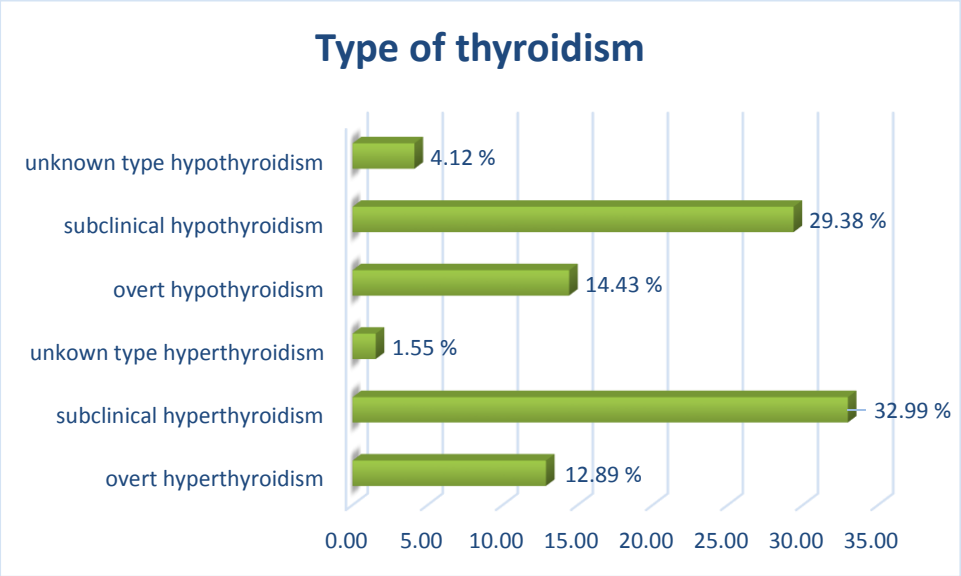


Fig 4.12 Types of Hyper and Hypothyroidism

Of 194 patients 12.89% are suffering from overt hyperthyroidism, and 32.99% are suffering from subclinical hyperthyroidism. 14.43% are suffering from overt hypothyroidism and 29.38 % are suffering from subclinical hypothyroidism.

4.13 Duration of sufferings

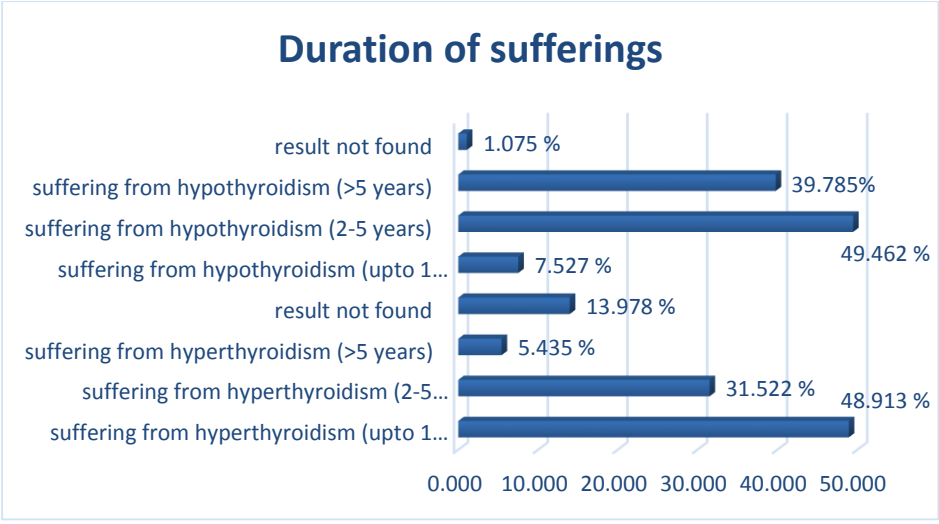


Fig 4.13 Duration of sufferings (in years)

Among 194 patients, 92 hyperthyoridim containing patients, 31.522% patients are suffering from this disorder 2-5 years, 5.43 % are suffering for more than 5 years and 48.91% of them are suffering for 1years or less than 1 year. Again, from 93 patients, 7.5% are suffering from 1 years or less than 1 year, 49.63% are suffering from 2-5 years and 39.78% are suffering from 5 or more years.

4.14 Causes of Hyperthyroidism

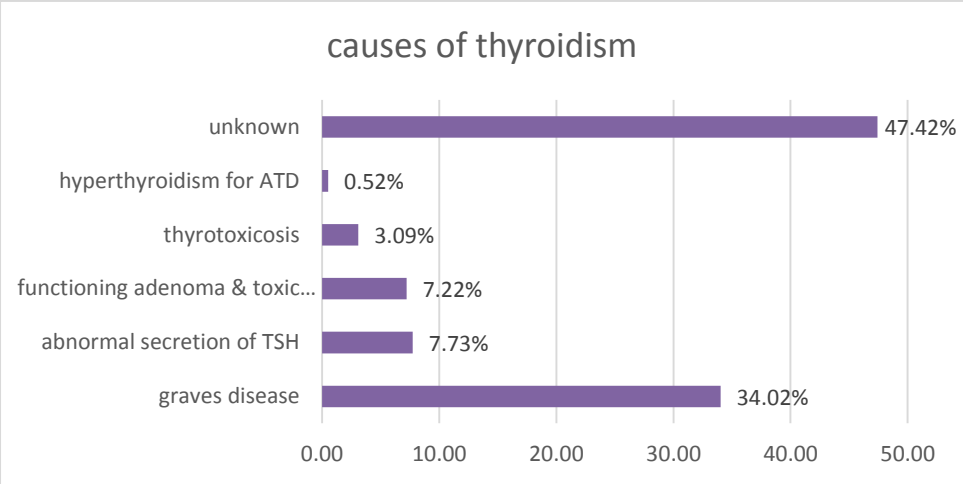


Fig 4.14 The causes of hyperthyroidism

Of all thyroid disorder containing patients 35% have Graves' disease, 8% have abnormal secretion of TSH, and 7.5% have functioning adenoma or toxic multinodular goiter, and 3.09% having thyrotoxicosis and 48% patients do not know their cause – why they are having their disorder.

4.15 Symptoms of hyperthyroidism

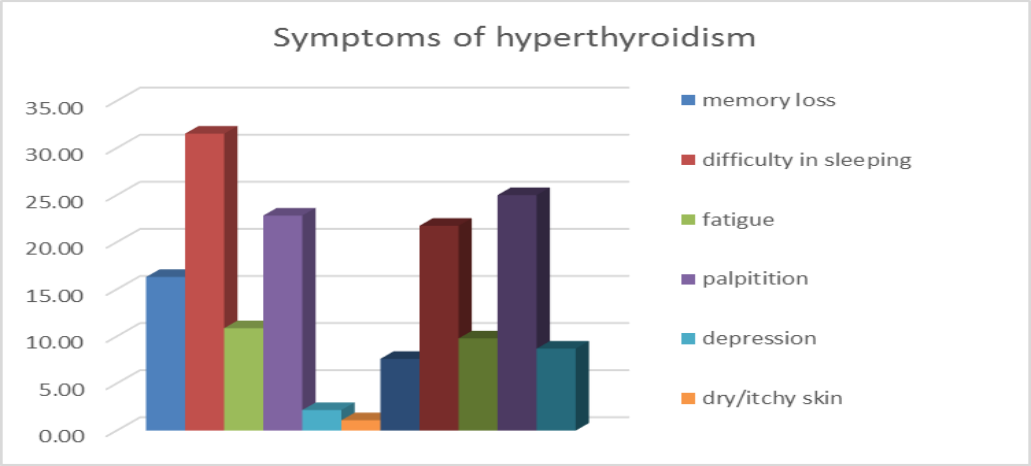


Fig 4.15 Symptoms of hyperthyroidism

16.30% patients having memory loss, 31.52% patients having difficulty in sleeping, 10.87% of them have fatigue, 22.83% having palpitation, 2.17% have depression, 1.09% patients have dry skin, 7.61% losing their weight, 21.74% have pain or swelling in front of their neck, 2o% have eye pain and protrusion of eyes, 16.47% have excess sweating, 23.53% of them having intolerance of heat, and 8.24% are having tremor in different parts of their body.

4.16 Symptoms of hypothyroidism

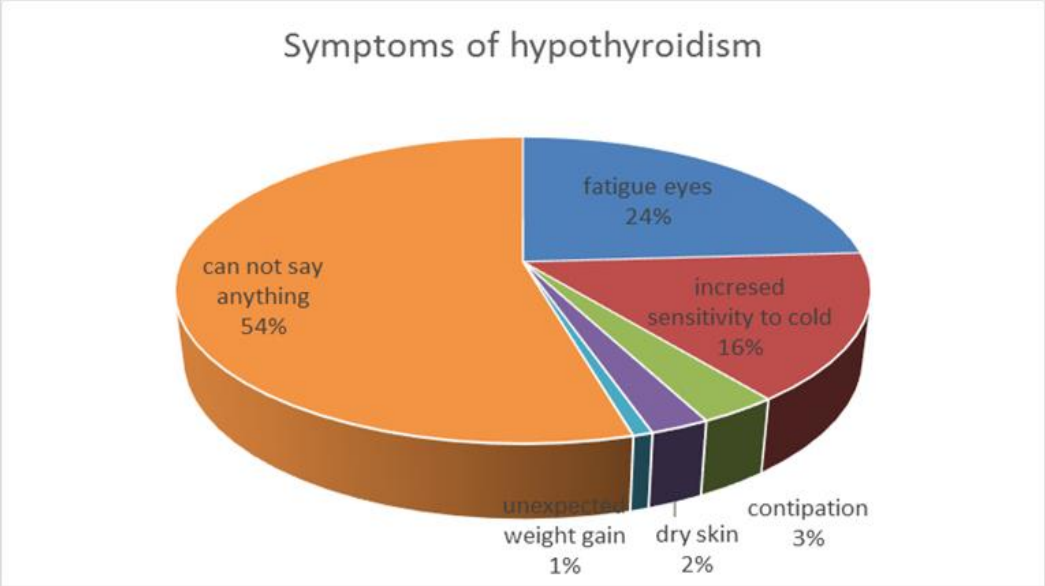


Fig 4.16 Symptoms of hypothyroidism

Of all Hyperthyroid disordered patients approximately- 24% have fatigue eyes, 16% have increased sensitivity to cold,3% have constipation, 2% have dry skin, 1% having unexpected weight gain, & 54% cannot understand their symptoms clearly.

4.17 Type of tests for determining hypothyroidism

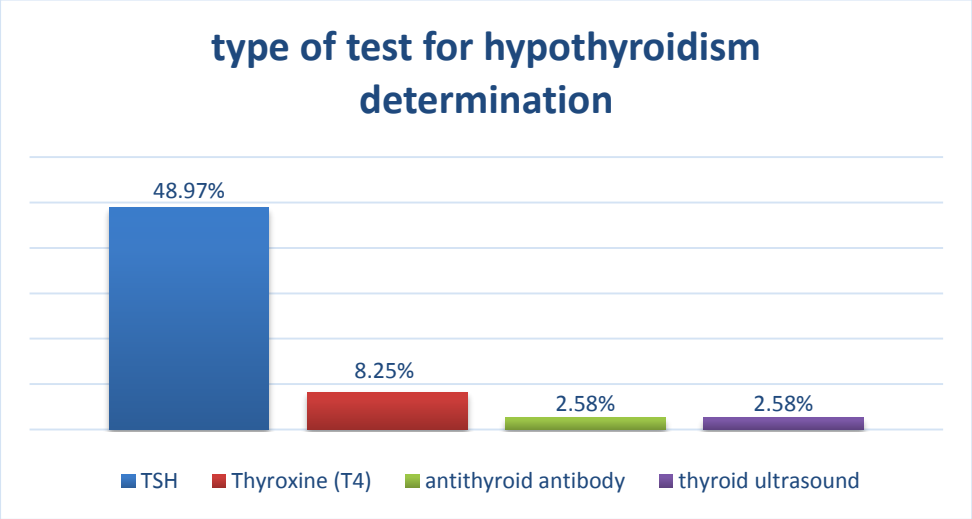


Fig 4.17 Type of tests for determining hypothyroidism

For determining hypothyroidism, physicians suggest to do majorly TSH test 49%, T4 test 9%, antithyroid antibody test 3%, and in some cases 2.6% thyroid ultrasound.

4.18 Type of tests for determining hyperthyroidism

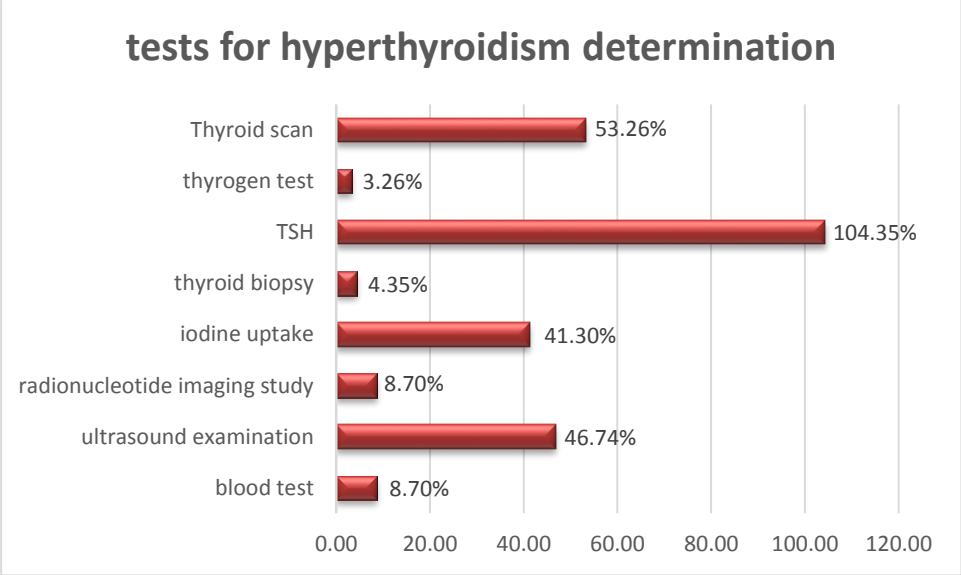


Fig 4.18 Type of tests for hyperthyroidism diagnosis

For determining hyperthyroidism, physicians suggest to do blood test 9%, TSH Test 100%, ultrasound examination 45%, iodine uptake test 42%, thyroid scan 54%, & in some cases thyroid biopsy 4.5 % if there is any surgery.

4.19 Blood Tests

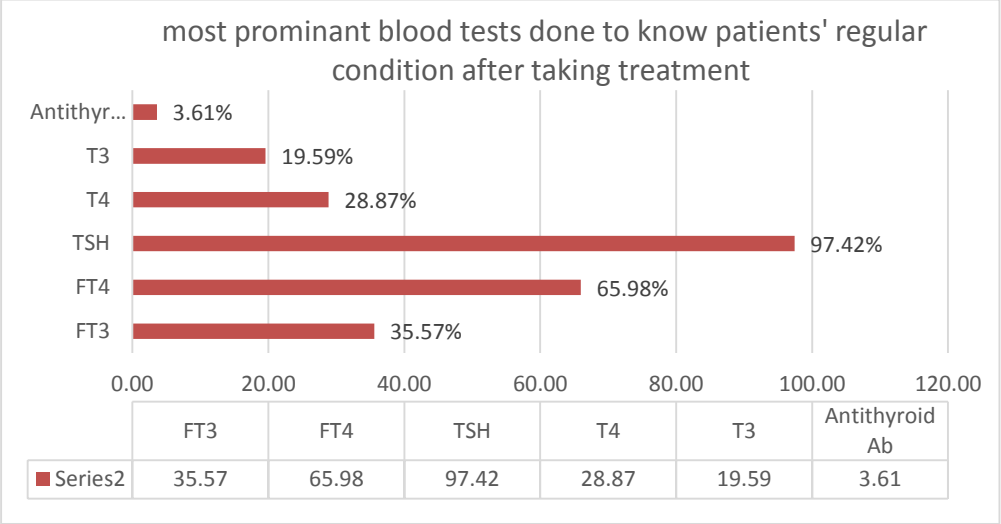


Fig 4.19 Blood tests used for knowing patient's condition after treatment

Physicians check TSH level the most 97.42% then FT4 level 65.98%, FT3 level 35.57%, T4 level 28.87%, T3 level 19.59%, & Anti thyroid Antibody 3.61% . For knowing patients' response towards the treatment pattern, or whether they have to change the treatment.

4.20 Treatment

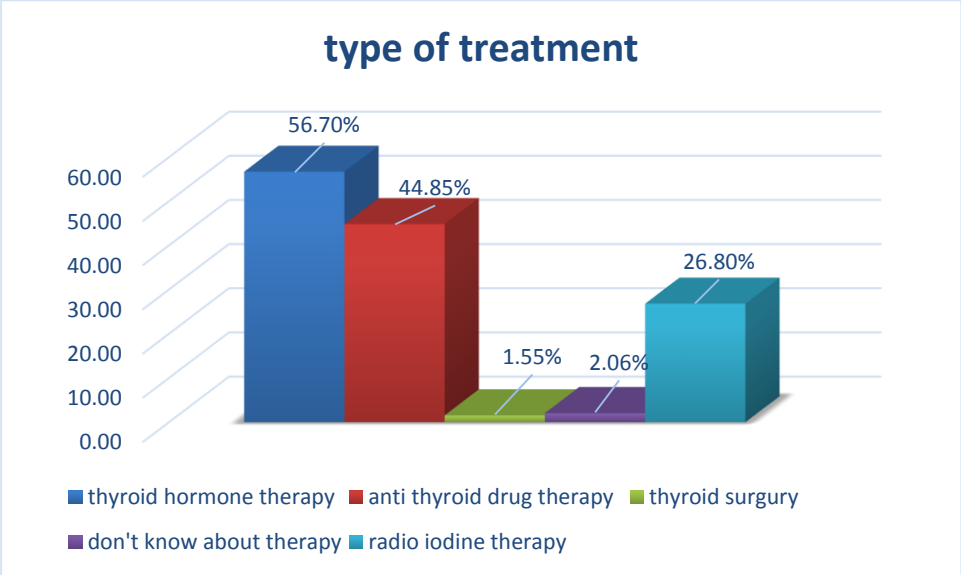


Fig 4.20 Percent of Treatment types for hypo/hyperthyroid patients

Majority 56.70% of them are treated with thyroid hormone therapy, 44.85% are treated with anti-thyroid drug therapy, 26.80% are taking radio iodine therapy, 1.55% have thyroid surgery, & 2.06% do not take any therapy.

4.21 Medications prescribed to hyperthyroid patients

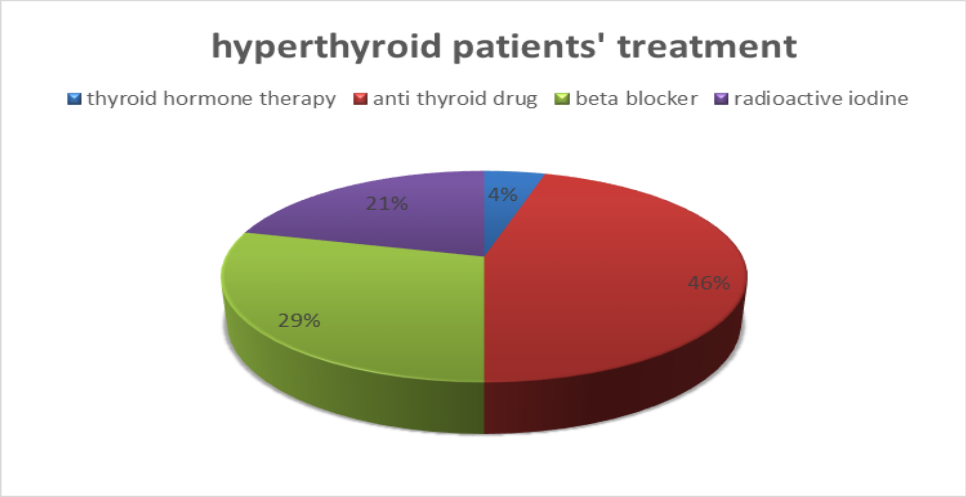


Fig 4.21 Medications suggest for hyperthyroid patients

Among 92 patients 4% taken thyroid hormone therapy, 46% are treated with anti-thyroid drug, 29% are taken beta blockers & 21% takes radioactive iodine.

4.22 Medications suggest for thyroid disordered patients

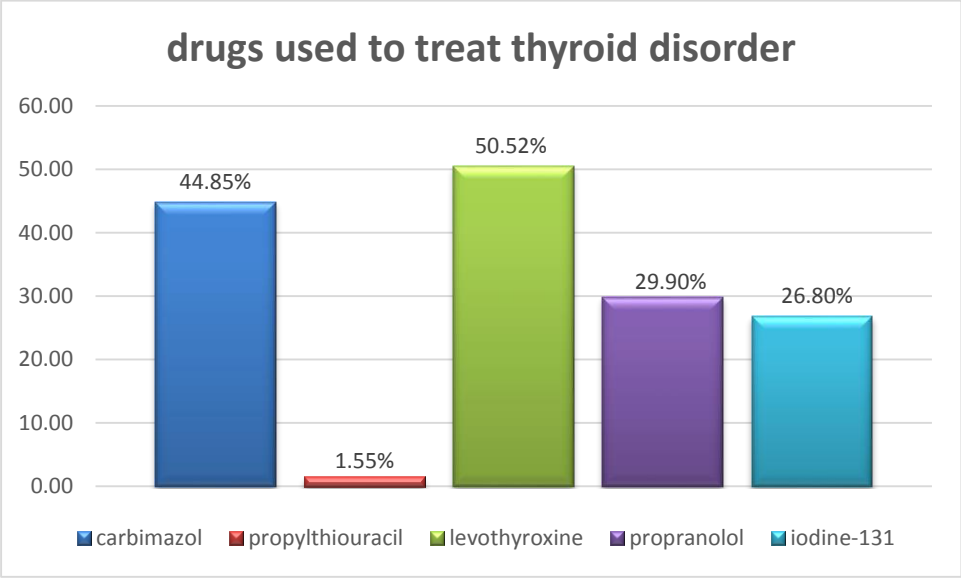


Fig 4.22 Percent of medications taken by patients

Majority of patients are treated with anti thyroid drugs, and mainly carbimazol 44.85%, in addition with this30% patients are treated with Beta blockers specially propranolol, some are given PTU 1.5% only, if any adverse response to carbimazol, some patients after taking anti- hyperthyroid treatment may develop hypothyroidism, in that case they are given Levothyroxine, and some are treated with radioactive iodine only 1%, 26.80% are treated

with iodine 131. All Hypothyroidism patients are mainly treated with Levothyroxine as their severity is less than Hyperthyroidism patients.

4.23 Medication taking time

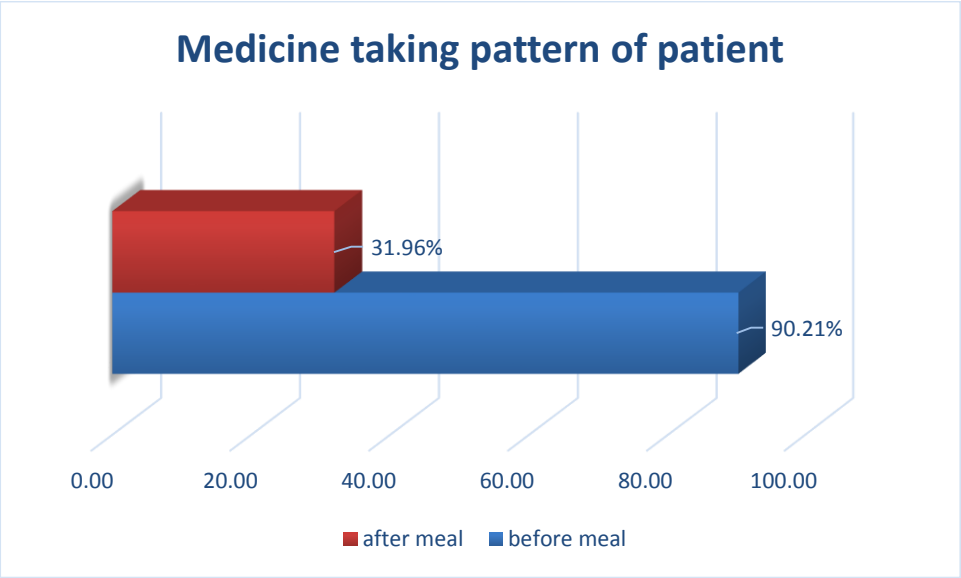
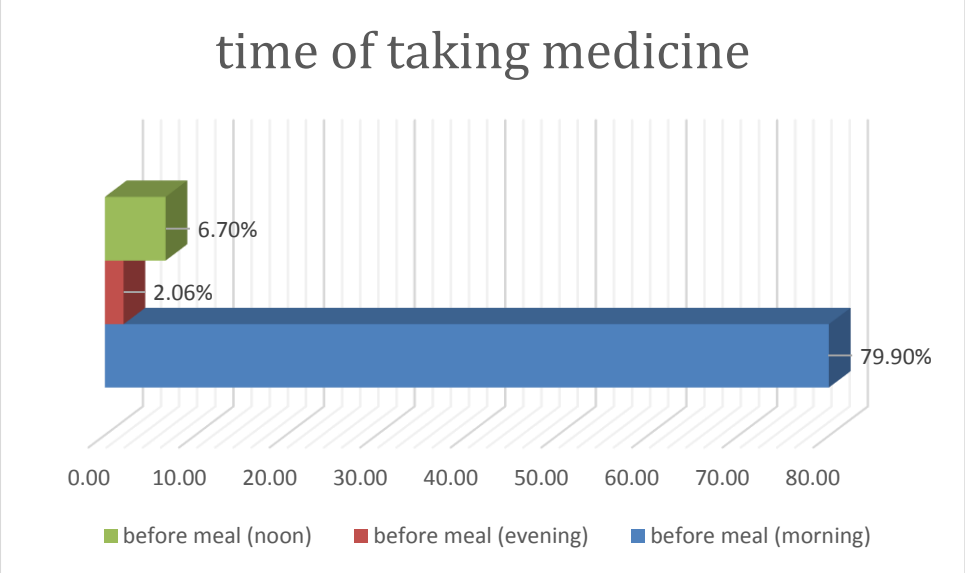
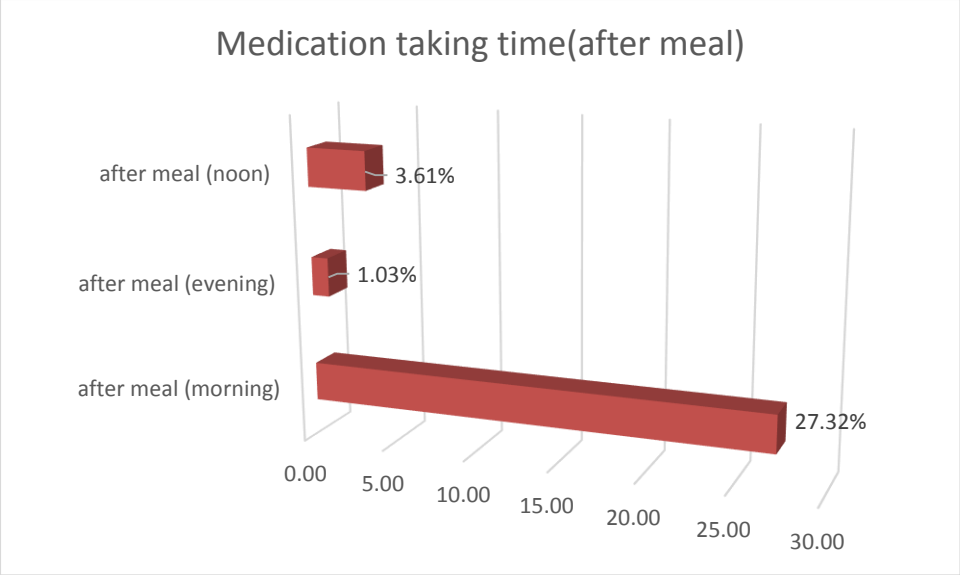


Fig 4.23 Medication taking time

Among 179 participating patients 90.21%takes their medication before meal, 31.96% takes their medication after meal. Among these 90.21% patients, who takes medication before meal-



Among 90.50% patients, 80% takes their medication in morning, 2.06% takes in evening and 6.70% takes in noon. And those who takes after meal-



Among 31.96% patients 27.32% takes medication in morning, 1.03% takes in evening and 3.61% takes at noon.

4.24 Complications after having hyperthyroid medication

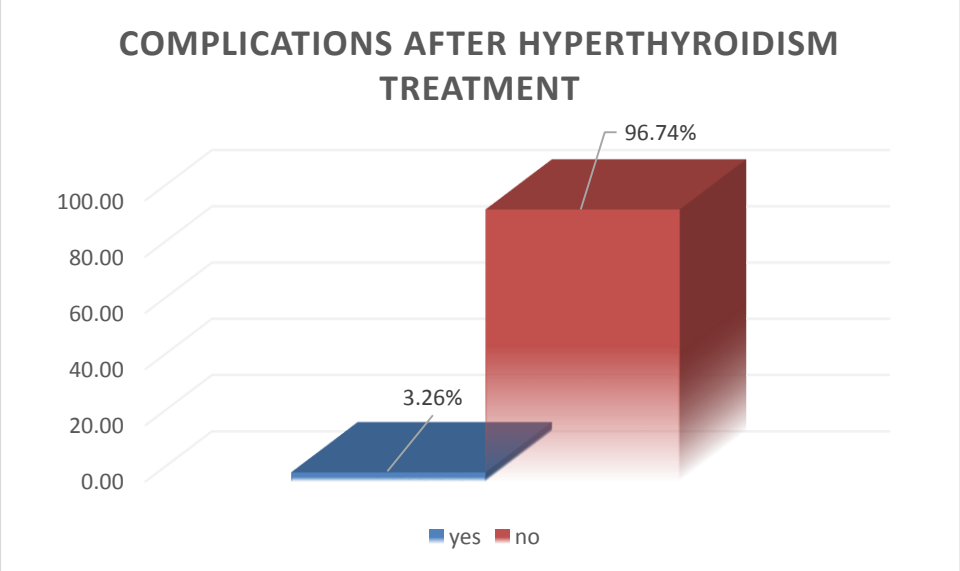


Fig 4.24 Complications after having hyperthyroid medication

97% of participating patients do not facing any problem, bt only 3% of them claimed that they have some mild problems.

4.28 Complications after having hypothyroid medication

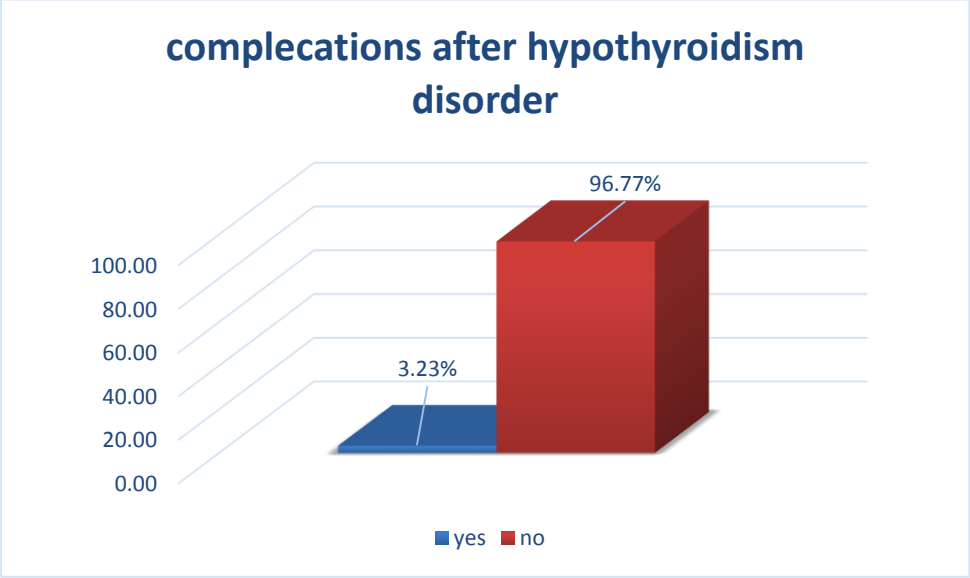


Fig 4.28 Complications after having hypothyroid medication

97% of participating patients do not facing any problem, but only 3% of them claimed that they have some mild problems.

4.29 Medication on time

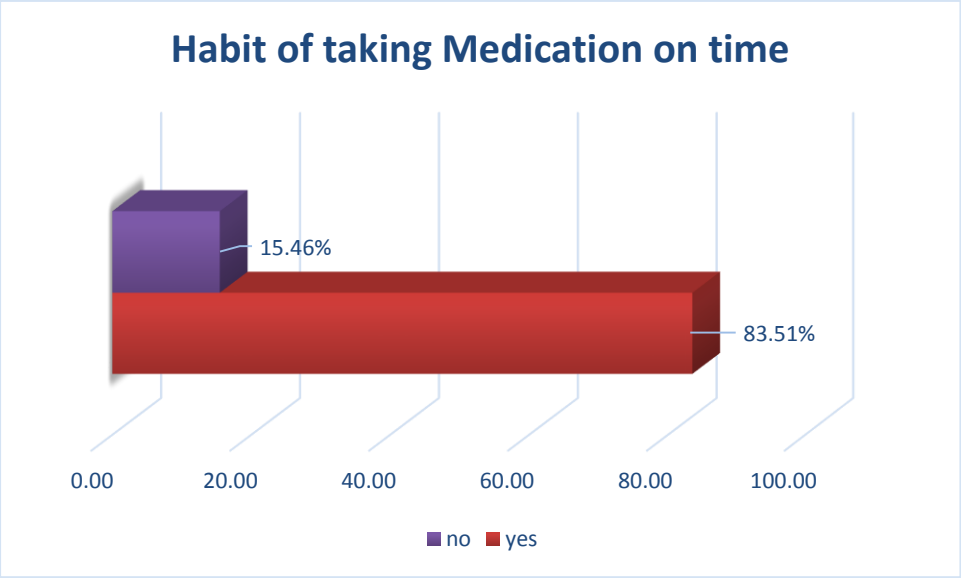


Fig 4.29 Habit of taking Medication on time

83.5% patients take their medication on time and 15.46% do not regular in taking their medicine.

4.30 Perception about disease recovery

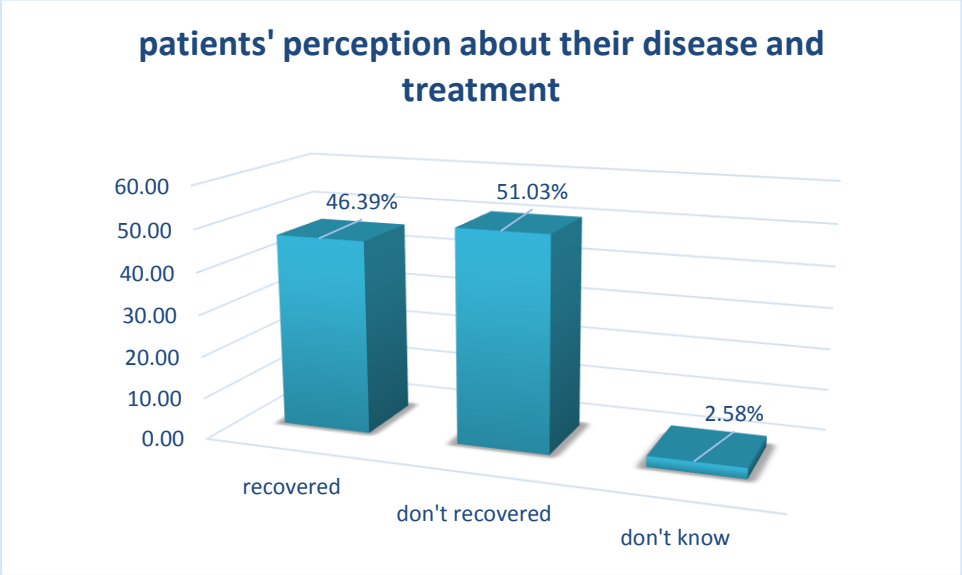


Fig 4.30 Perception about disease recovery

47% of patients think that they will recovered but 51% don't think that they might be fully recovered & 3% people don't know their fate.

4.31 Satisfactory level of Physician's consultancy and assistance

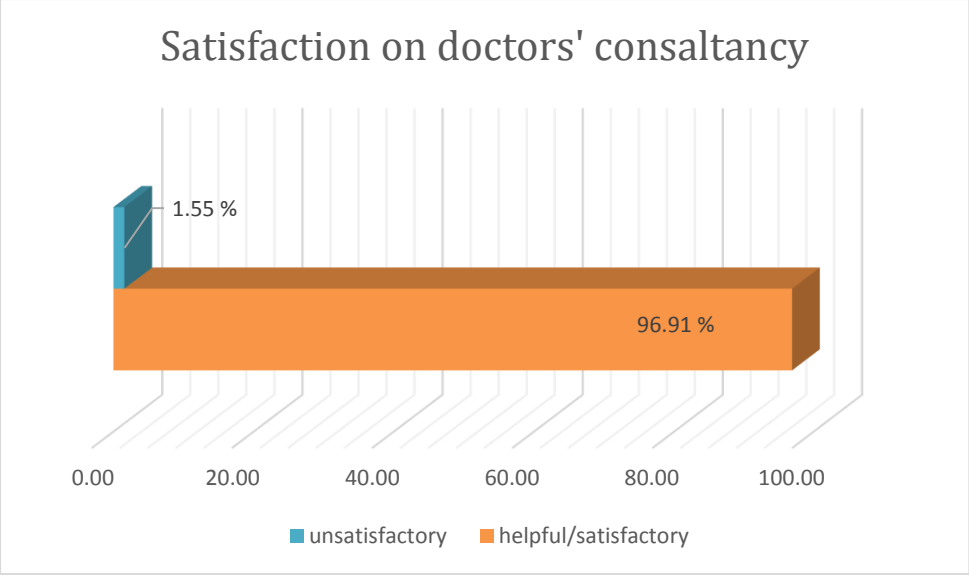


Fig 4.31 Physician's consultancy in satisfied range

Almost all patients 96.91% are satisfied about doctor's consultancy and only 1.55% shows dissatisfaction.

4.32 Regular in check up

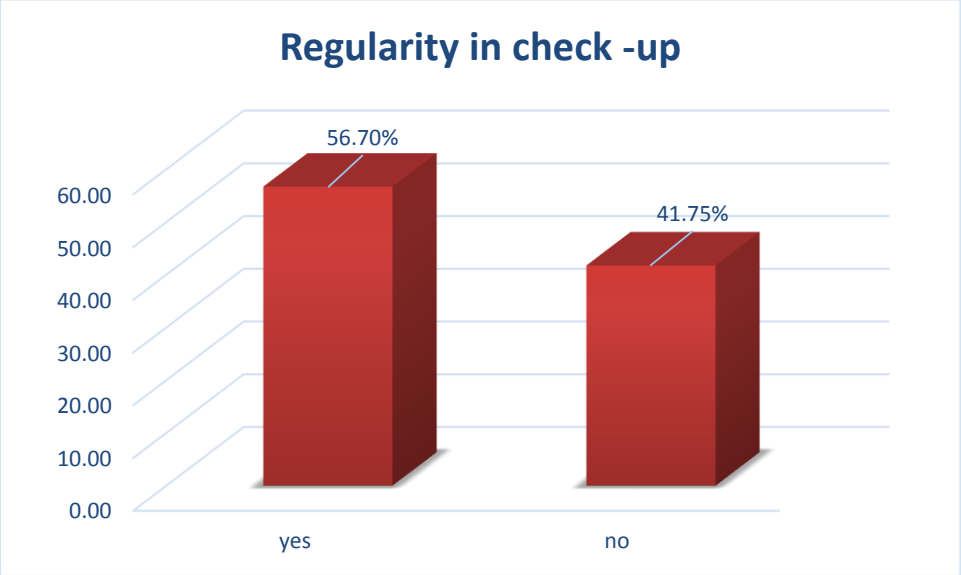


Fig 4.32 Regular in check up as routine work

56.70% of all patients were regular in checkup. And 41.75% were not regular in checkup.

4.33 Complexity of dosage administration /treatment form

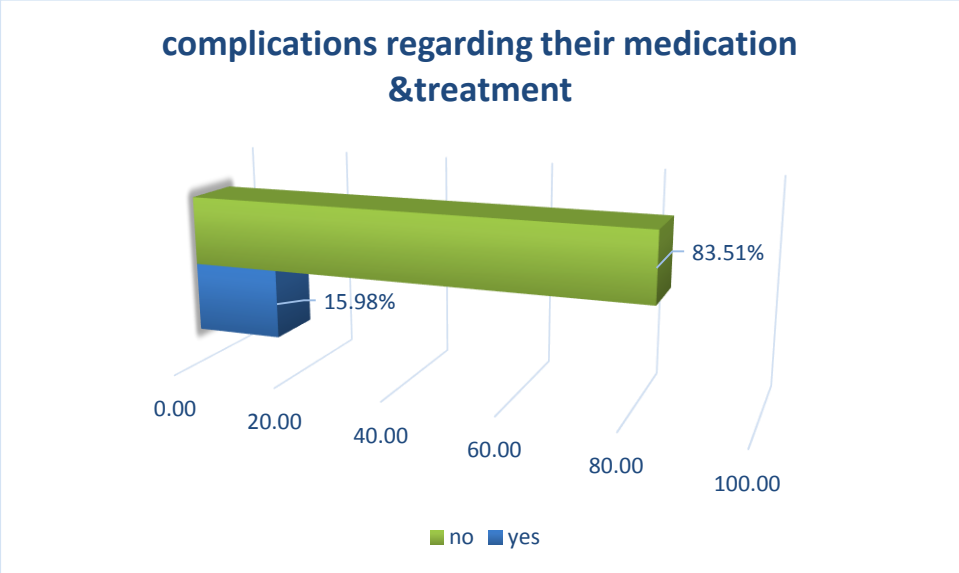


Fig 4.33 complexity of dosage administration /treatment form

83.51% don't found their treatment pattern complex, but 15.98% claimed it complex.

4.34 Missed dose recovery pattern

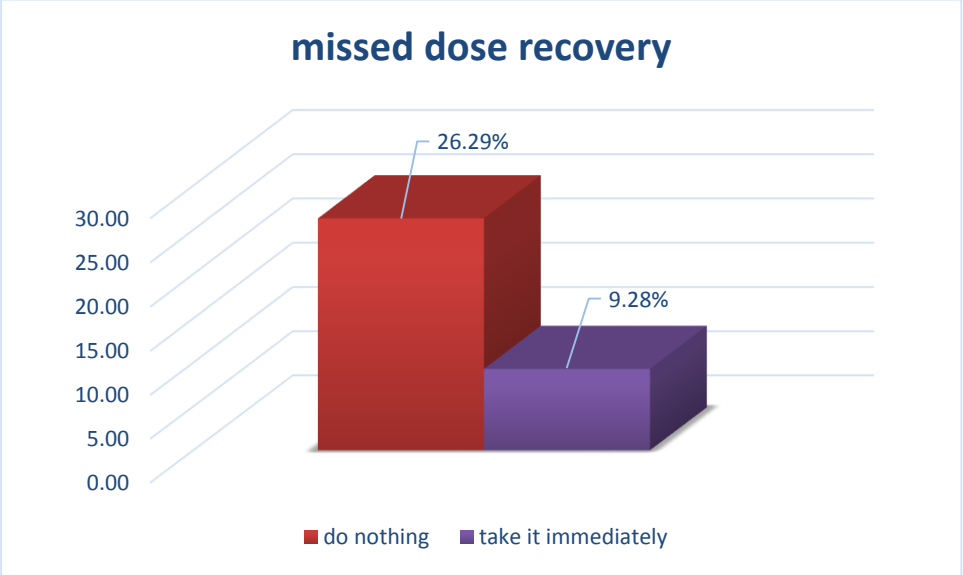


Fig 4.34 Missed dose recovery pattern when they missed dose

26.29% irregular patients jst do nothing if they missed any dose, and some patients about 9.28% take their missed dose immediately.

4.35 Maintaining their weight

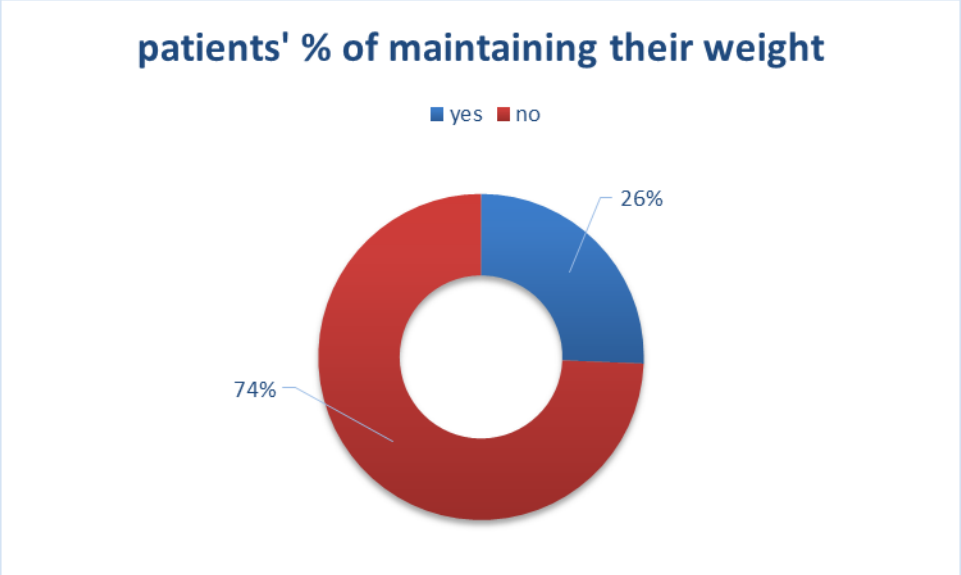


Fig 4.35 Percentage of patients maintaining their weight

26% patients of total patients try to maintain their weight. And 74% are not conscious about their body weight. From those who control their body weight, majority was hypothyroidism patients.

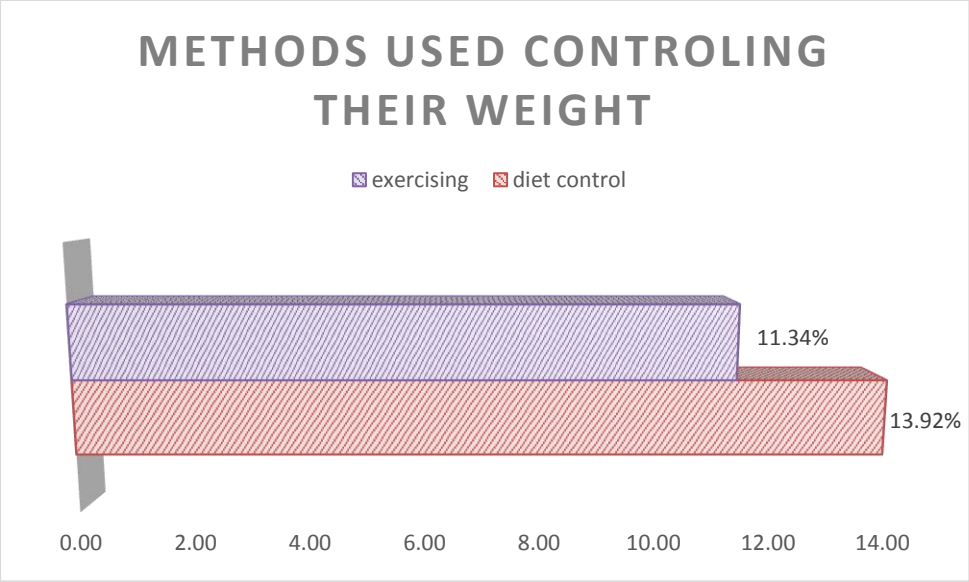


Fig 4.36 Methods used for controlling patients' weight

11.34% doing some exercise and 13.92% controls their diet.

4.36 Other health problems

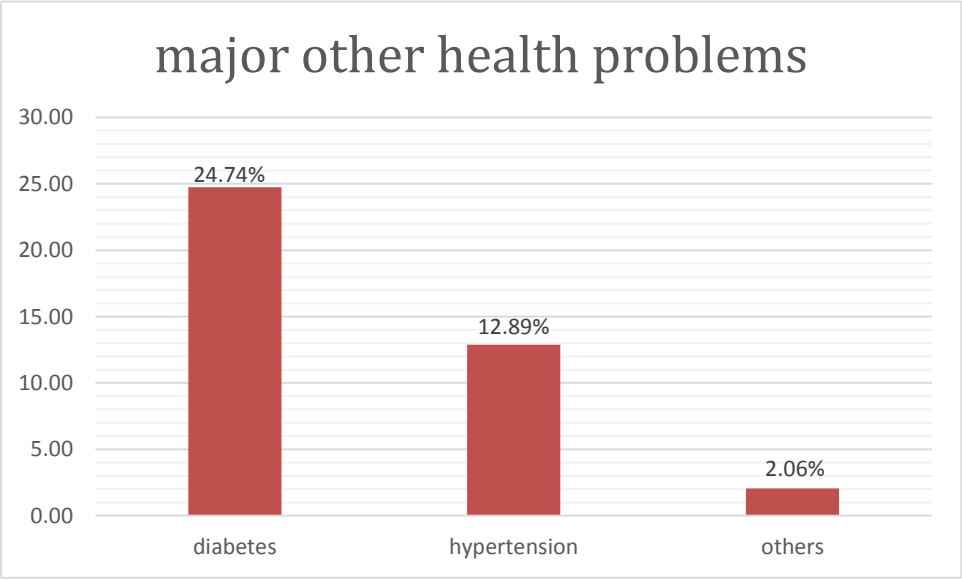


Fig 4.37 Percentage of other major health problems

24.74% have diabetes, 12.89% have hypertension and 2.06% have some other complications or surgery.

4.37 Number of Menopaused patients

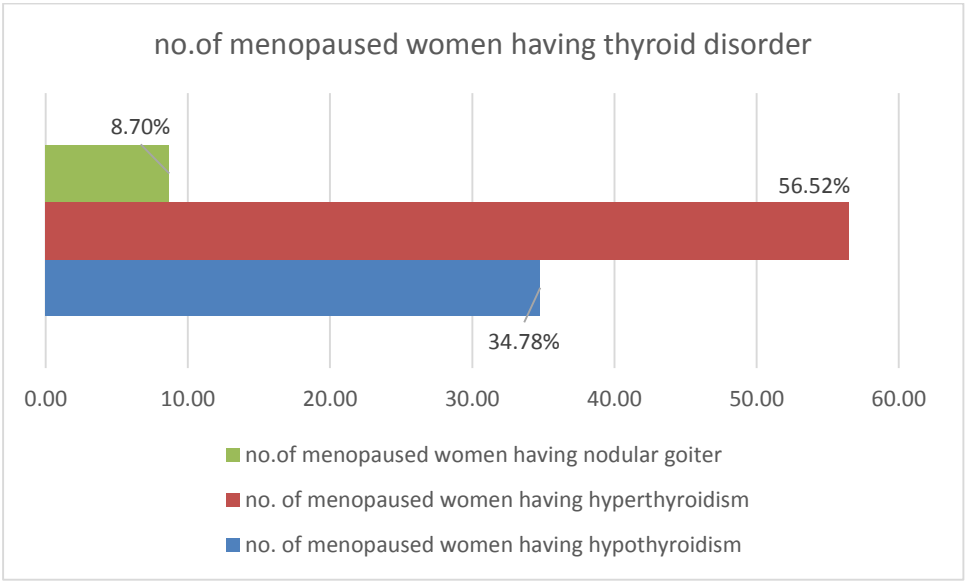


Fig 4.38 percentage of menopause patients

Among 151 female patients, 23 are menopause. And among them 56.5% have hyperthyroidism, 35% have hypothyroidism & 9% having nodular goiter.

4.38 Pregnant women with thyroid problem

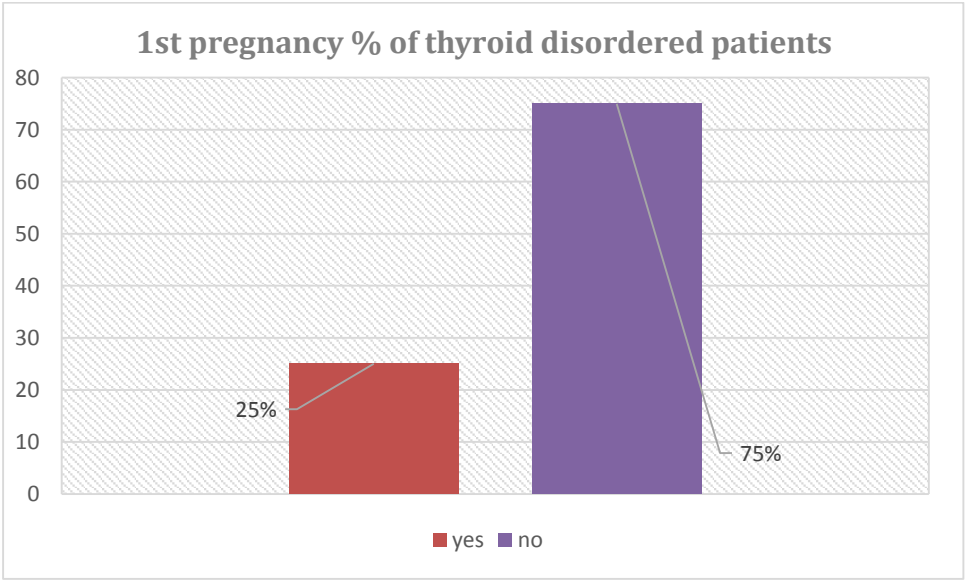


Fig 4.39 Pregnant women with thyroid problem

Among 8 pregnant patients 25% or 2 are having their 1st pregnancy and 75% or 6 patients do not.

4.39 Causes for thyroid disorder during Pregnancy

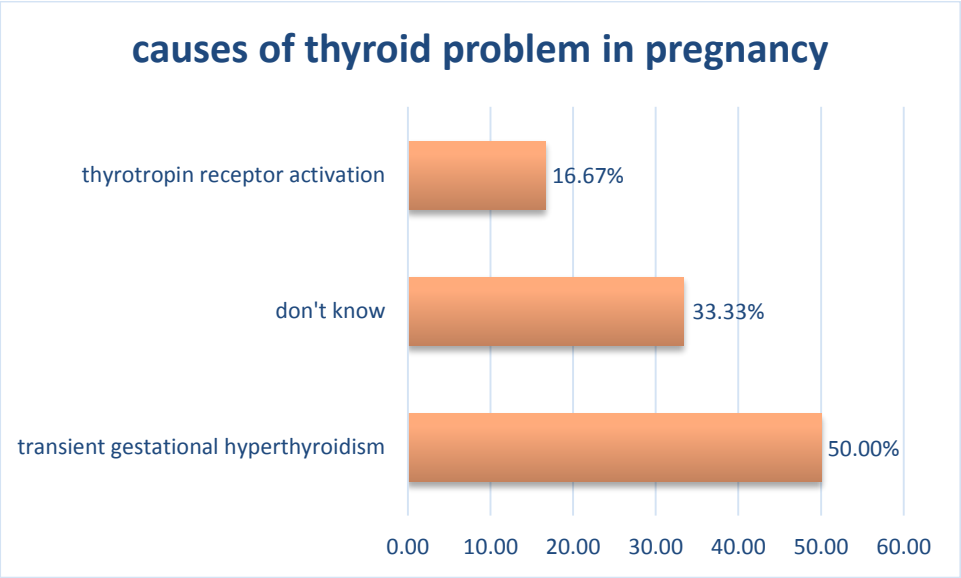


Fig 4.40 Causes for thyroid disorder during Pregnancy

33.3% of them have previous complications and 33.34% do not have & 33.34 do not know about their problem.

50% of them have transient gestational hyperthyroidism, 33% do not know the specific reason and 17% of them have overactive Thyrotropin receptor.

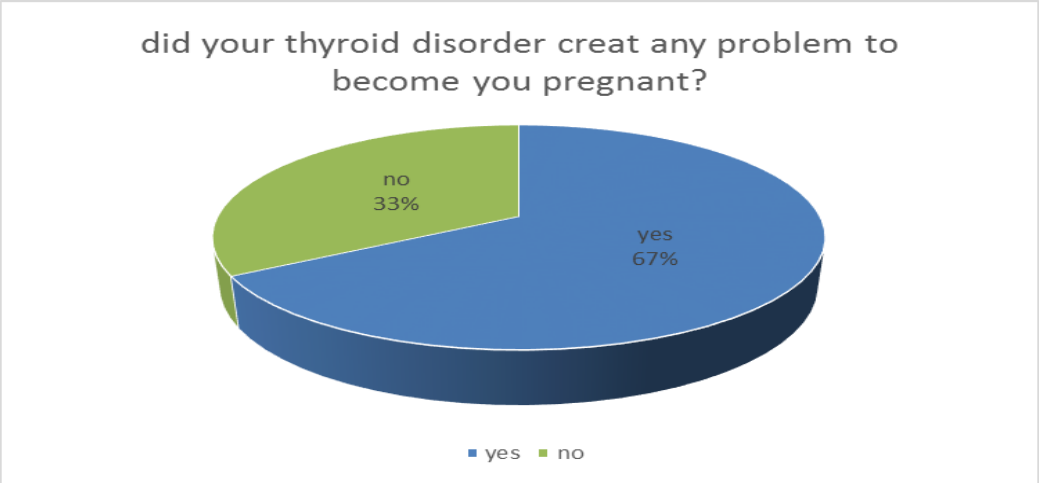


Fig 4.42 Thyroid disorder creates problem in becoming Pregnant

33% of them do not face any problem, but 67% faced problems to become pregnant and after becoming pregnant.

Chapter 5
Discussion

5 Discussion

Thyroid disorder is the second most common endocrine disorder in women both in the developed and less developed world (Hechtman, 2011). Its incidence is begin risen significantly worldwide through the years. Early detection of this disorder can be controlled the level of hormone easily and then, this would not become a life threatening disorder. Although there is no study held directly on endocrine disordered patients who have thyroid disorder in Bangladesh so, we have conducted a survey on 402 endocrine disordered patients. Here, we mainly focused on, Patients' diagnosis, treatment pattern, and patient's knowledge pattern and also their awareness and this study was done in 7 renowned institutions of Dhaka, Bangladesh.

In our study, we got 45.5% of endocrine disordered patients having thyroid disorder and rest have only glucose homeostasis disorder 48% who are also have chance to have thyroid disorder. And other have hypertension and diabetes in association with thyroid dysfunction.Among 194 thyroid disordered patients 48% are having hypothyroidism and 47% having hyperthyroidism.

Females are 5 times more vulnerable than males to hypothyroidism (Thyroidu.com,2012). We have found the same result in our study where 78.26% had hyperthyroidism, and, (76.34%) had hypothyroidism. But, approximately 10 million Americans have this common medical condition. In fact, as many as 10% of women may have some degree of thyroid hormone deficiency (Norman, 2014). Similarly, in another study in America, the prevalence of hyperthyroidism in community-based studies has been estimated at 2% for women and 0.2 % for men (Reid and wheeler, 2005).

In our study we got, majority of patients are in the age limit 21-40 years (51.03%), and age 41-60 years were of (31.44%). But according to American Thyroid Association hyperthyroidism mostly occurs in more than 60 years old people (thyroid.org, 2012). Again, according to Australian bureau of statistics, 51- over 80 years old Australian people having more thyroid disorder in terms of hypo- and hyperthyroidism (Thyroid flyer, 2000). On the other hand, in our country this disorder develops in a tender age.

In our study we found that, majority of the BMI status of patients with Hyperthyroidism were normal weighted(62.35%), but, in case of hypothyroidism it was only 35.29 % and a high prevalence of overweight 21.18%were found. So, some conscious patients maintains

their health by controlling their diet and taking some kind of physical exercise although they are only 26% of total thyroid dysfunctional patients.

In 194 hyperthyroid containing patients, 12.89% are suffering from overt hyperthyroidism, and 32.99% were suffering from subclinical hyperthyroidism. Where in an Indian study, subclinical hyperthyroidism was detected in 5.1% cases of JAT, and none had overt hyperthyroidism (John, 2008). Among them most of the people were suffering for more than 1 year. Although most of the patients do not know the cause of hyperthyroidism (47.42%), but Graves' diseases was in high percentage (34.02%),which is similar to a study of Kentucky, Graves' disease is the most common cause of hyperthyroidism, accounting for 60 to 80 percent of all cases (Weetman, 2000). Majority have difficulty in sleep(31.82%), palpitation (22.83%), tremor and anxiety, these patients are mostly treated with anti-thyroid drugs (46%), and beta blocker (29%).which is also supported by American Thyroid Association. But in our study we see that patients are treated with carbimazole where in America patients were mostly treated with methimazole and propylthyouracil(thyroid.org, 2012).

Again in our study among 194 hypothyroidism patients, (14.43%) are suffering from overt hypothyroidism and (29.38 %) were suffering from subclinical hypothyroidism. Among them most of the people were suffering more than 2 years. So, we can say that, although this disorder is not as much as severe as hyperthyroidism, because in most of the patients even after they were suffering from many years but they need not to take any RIA (Radio Immune Assay) or hormone replacement therapy. Again in another study held in India, overt clinical and biochemical hypothyroidism was seen in 6.5% and subclinical hypothyroidism in 15% (John, 2008). In our study, most of hypothyroidism having people do not know about their symptoms (54%), and majority were having fatigue eyes and cold sensitivity. And to determine their condition according to their symptoms. According to American Thyroid Association, Subclinical hypothyroidism may cause mild symptoms or no symptoms at all (thyroid.org, 2012). For diagnosis, TSH level is checked the most (97.42%). After determination, 56.70% of them are treated with thyroid hormone therapy, (44.85%) were treated with anti-thyroid drug therapy in our country.

And from our study, we also found that,menopaused and pregnant women were also suffered from this disorder. Among23 menopause patients' majority having

hyperthyroidism & the rest having hypothyroidism. And 66% of pregnant women may have some difficulties during or before their pregnancy because of this disorder, as thyroid hormone has a major effect on reproductive system in both male and female.

Again, in our study we found, 47% of patients think that they will recovered but 51% don't think that they might be fully recovered & 3% people don't know their fate. 56.70% of all patients were regular in checkup. And 41.75% were not regular in checkup. 83.5% patients take their medication on time especially at morning before meal 75% almost, and 15.46% did not regular in taking their medicine. 83.51% don't found their treatment pattern complex, but 15.98% claimed it complex. Although, 73.13% patients were educated and at least passed SSC, but unfortunately, only 34.02% can provide their family history and among them, majority (18.04%) got their disorder from their mother. So, we can say from our study, the majority of patients are concerned about their disease and taking their medications regularly. Because most of the people were educated so they were more conscious with their diagnosis, treatment and medication, but at the same time they were having lack of consciousness about the risk factors and family history.

Chapter 6
Conclusion

6 Conclusion

In conclusion, the results of the present study revealed the prevalence of thyroiddisordered patients and the rate of hyper and hypothyroidism among them, their consciousness and perception about their disorder and moreover their treatment pattern and compliance. It had been found that the knowledge about patients having family history ofthyroid disorder is very low in both educated and the illiterate patients. Most of the patients were women. But most patients are not as severe as they were suffering from have sub clinical hypo- or hyper thyroidism. Majority were quite healthy as their BMI was in normal range, and as most patients are educated, they were conscious about their treatment.But still they do not have any clear perception about their disease. They do not know the severity of their disease and treatment outcome. On the other handawareness would lead to early detection and reduce the stage at diagnosis, potentially improve patient's knowledge and more cost effective treatment should be easily provided. So, efforts should be made by Government and Non- Governmental agencies to improve the knowledge about thyroid disorder. Here in this study we only focusedon Hyper and Hypothyroidism but further studies can be done on other thyroid related disorder to widen this study in large sphere.

Chapter 7
Reference

7 References

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