STUDY FOR INCIDENCE OF MALIGNANCY IN SOLITARY THYROID NODULE

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 **ABSTRACT**

 **Introduction:** Common presentation of thyroid disorders is solitary nodule. A discrete swelling in an otherwise impal-pable gland is termed as solitary nodule of thyroid. The ma-jorityof solitary thyroid nodules are benign.The incidence of malignancy is 10-20%,being more common in females with a mean age of 35 years. Present study was aimed to identify the incidence of malignancy in solitary nodule thyroid.

 **Material and methods:** The study was carried out in department of general surgery, AL-Hussain Teaching Hospital, Thi-qar, in 53 patients with solitary thyroid nodule from Septemper 2018 to March 2019

 **Results:** The solitary thyroid nodules were seen in 1.76% of surgical admissions. The mean age of the incidence of solitary thyroid nodule is 35 years. The incidence of malignancy in solitary thyroid nodule is 43.7% The solitary thyroid nodules were frequent in females than males in the ratio of 5.3:1.

 **Conclusions:** It is concluded from the present series that 43.7% of solitary thyroid nodules are malignant, with female preponderance and a mean age of solitary thyroid nodule is 35years.

 **Keywords:** Solitary thyroid nodule, Malignancy, age, sex, incidence.

THYROID GLAND

INTRODUCTION

**Historical Background**

Goiters (from the Latin *guttur*, throat), defined as an enlargement

of the thyroid, have been recognized since 2700 b.c. even

though the thyroid gland was not documented as such until the

Renaissance period. In 1619, Hieronymus Fabricius ab Aquapendente

recognized that goiters arose from the thyroid gland.

The term *thyroid gland* (Greek *thyreoeides*, shield-shaped) is,

however, attributed to Thomas Wharton in his *Adenographia*

(1656). In 1776, the thyroid was classified as a ductless gland

by Albrecht von Haller and was thought to have numerous functions

ranging from lubrication of the larynx to acting as a reservoir

for blood to provide continuous flow to the brain, and to

beautifying women’s necks. Burnt seaweed was considered to

be the most effective treatment for goiters.

Embryology

The thyroid gland arises as an outpouching of the primitive

foregut around the third week of gestation. It originates at the

base of the tongue at the foramen cecum. Endoderm cells in

the floor of the pharyngeal anlage thicken to form the medial

thyroid anlage that descends in the neck anterior

to structures that form the hyoid bone and larynx. During its

descent, the anlage remains connected to the foramen cecum

via an epithelial-lined tube known as the thyroglossal duct. The

epithelial cells making up the anlage give rise to the thyroid follicular

cells. The paired lateral anlages originate from the fourth

branchial pouch and fuse with the median anlage at approximately

the fifth week of gestation. The lateral anlages are neuroectodermal

in origin (ultimobranchial bodies) and provide the

calcitonin producing parafollicular or C cells, which thus come

to lie in the superoposterior region of the gland. Thyroid follicles

are initially apparent by 8 weeks, and colloid formation

begins by the eleventh week of gestation

Thyroid Anatomy

The anatomic relations of the thyroid gland and surrounding

structures are depicted in . The adult thyroid gland

is brown in color and firm in consistency and is located posterior

to the strap muscles. The normal thyroid gland weighs

approximately 20 g, but gland weight varies with body weight

and iodine intake. The thyroid lobes are located adjacent to the

thyroid cartilage and connected in the midline by an isthmus

that is located just inferior to the cricoid cartilage. A pyramidal

lobe is present in about 50% of patients. The thyroid lobes

extend to the midthyroid cartilage superiorly and lie adjacent to

the carotid sheaths and sternocleidomastoid muscles laterally.

The strap muscles (sternohyoid, sternothyroid, and superior

belly of the omohyoid) are located anteriorly and are innervated

by the ansa cervicalis (ansa hypoglossi). The thyroid gland is

enveloped by a loosely connecting fascia that is formed from

the partition of the deep cervical fascia into anterior and posterior

divisions. The true capsule of the thyroid is a thin, densely

adherent fibrous layer that sends out septa that invaginate into

the gland, forming pseudolobules. The thyroid capsule is condensed

into the posterior suspensory or Berry’s ligament near

the cricoid cartilage and upper tracheal rings.

**Blood Supply.** The superior thyroid arteries arise from the

ipsilateral external carotid arteries and divide into anterior and

posterior branches at the apices of the thyroid lobes. The inferiorthyroid arteries arise from the thyrocervical trunk shortly after

their origin from the subclavian arteries. The inferior thyroid

arteries travel upward in the neck posterior to the carotid sheath

to enter the thyroid lobes at their midpoint. A thyroidea ima artery

arises directly from the aorta or innominate in 1% to 4% of individuals

to enter the isthmus or replace a missing inferior thyroid

artery. The inferior thyroid artery crosses the recurrent laryngeal

nerve (RLN), necessitating identification of the RLN before the

arterial branches can be ligated. The venous drainage of the thyroid

gland occurs via multiple small surface veins, which coalesce

to form three sets of veins—the superior, middle, and inferior

thyroid veins. The superior thyroid veins run with the superior

thyroid arteries bilaterally. The middle vein or veins are the least

consistent. The superior and middle veins drain directly into the

internal jugular veins. The inferior veins often form a plexus,

which drains into the brachiocephalic veins.

**Nerves.** The left RLN arises from the vagus nerve where it

crosses the aortic arch, loops around the ligamentum arteriosum,

and ascends medially in the neck within the tracheoesophageal

groove. The right RLN arises from the vagus at its crossing with

the right subclavian artery. The nerve usually passes posterior

to the artery before ascending in the neck, its course being more

oblique than the left RLN. Along their course in the neck, the

RLNs may branch, and pass anterior, posterior, or interdigitate

with branches of the inferior thyroid artery . The right

RLN may be nonrecurrent in 0.5% to 1% of individuals and often

is associated with a vascular anomaly. Nonrecurrent left RLNs

are rare but have been reported in patients with situs inversus and

a right-sided aortic arch. The RLN may branch in its course in the

neck, and identification of a small nerve should alert the surgeon

to this possibility. Identification of the nerves or their branches

often necessitates mobilization of the most lateral and posterior

extent of the thyroid gland, the tubercle of Zuckerkandl, at the

level of the cricoid cartilage. The last segments of the nerves

often course below the tubercle and are closely approximated to

the ligament of Berry. Branches of the nerve may traverse the

ligament in 25% of individuals and are particularly vulnerable

to injury at this junction. The RLNs terminate by entering the

larynx posterior to the cricothyroid muscle.

The RLNs innervate all the intrinsic muscles of the larynx,

except the cricothyroid muscles, which are innervated by the

external laryngeal nerves. Injury to one RLN leads to paralysis

of the ipsilateral vocal cord, which comes to lie in the paramedian

or the abducted position. The paramedian position results

in a normal but weak voice, whereas the abducted position leads

to a hoarse voice and an ineffective cough. Bilateral RLN injury

may lead to airway obstruction, necessitating emergency tracheostomy,

or loss of voice. If both cords come to lie in an abducted

position, air movement can occur, but the patient has an ineffective

cough and is at increased risk of repeated respiratory tract

infections from aspiration.

The superior laryngeal nerves also arise from the vagus

nerves. After their origin at the base of the skull, these nerves

travel along the internal carotid artery and divide into two

branches at the level of the hyoid bone. The internal branch of

the superior laryngeal nerve is sensory to the supraglottic larynx.

Injury to this nerve is rare in thyroid surgery, but its occurrence

may result in aspiration. The external branch of the superior

laryngeal nerve lies on the inferior pharyngeal constrictor muscleand descends alongside the superior thyroid vessels before innervating

the cricothyroid muscle. Cernea and colleagues2 proposed

a classification system to describe the relationship of this nerve

to the superior thyroid vessels . The type 2a variant,

in which the nerve crosses below the tip of the thyroid superior

pole, occurs in up to 20% of individuals and places the nerve at a

greater risk of injury. Therefore, the superior pole vessels should

not be ligated en masse, but should be individually divided, low

on the thyroid gland and dissected lateral to the cricothyroid muscle.

Injury to this nerve leads to inability to tense the ipsilateral

vocal cord and hence difficulty “hitting high notes,” difficulty

projecting the voice, and voice fatigue during prolonged speech.

Sympathetic innervation of the thyroid gland is provided

by fibers from the superior and middle cervical sympathetic

ganglia. The fibers enter the gland with the blood vessels and

are vasomotor in action. Parasympathetic fibers are derived

from the vagus nerve and reach the gland via branches of the

laryngeal nerves.

**Lymphatic System.**

The thyroid gland is endowed with an

extensive network of lymphatics. Intraglandular lymphatic vessels

connect both thyroid lobes through the isthmus and also drain

to perithyroidal structures and lymph nodes. Regional lymph

nodes include pretracheal, paratracheal, perithyroidal, RLN,

superior mediastinal, retropharyngeal, esophageal, and upper,

middle, and lower jugular chain nodes. These lymph nodes can

be classified into seven levels as depicted in . The central

compartment includes nodes located in the area between the two

carotid sheaths, whereas nodes lateral to the vessels are present

in the lateral compartment. Thyroid cancers may metastasize to

any of these regions, although metastases to submaxillary nodes

(level I) are rare (<1%). There also can be “skip” metastases to

nodes in the lateral ipsilateral neck without central neck nodes.

 **Thyroid Histology**

Microscopically, the thyroid is divided into lobules that contain

20 to 40 follicles . There are about 3 × 106 follicles

in the adult male thyroid gland. The follicles are spherical and

average 30 μm in diameter. Each follicle is lined by cuboidal

epithelial cells and contains a central store of colloid secreted

from the epithelial cells under the influence of the pituitary hormone

TSH. The second group of thyroid secretory cells is the C

cells or parafollicular cells, which contain and secrete the hormone

calcitonin. They are found as individual cells or clumped

in small groups in the interfollicular stroma and located in the

upper poles of the thyroid lobes.

**Thyroid Physiology**

**Iodine Metabolism.** The average daily iodine requirement is

0.1 mg, which can be derived from foods such as fish, milk,

and eggs or as additives in bread or salt. In the stomach and

jejunum, iodine is rapidly converted to iodide and absorbed

into the bloodstream, and from there it is distributed uniformly

throughout the extracellular space. Iodide is actively transported

into the thyroid follicular cells by an adenosine triphosphate

(ATP)–dependent process. The thyroid is the storage site of

>90% of the body’s iodine content and accounts for one third of

the plasma iodine loss. The remaining plasma iodine is cleared

via renal excretion.

**Thyroid Hormone Synthesis, Secretion, and Transport.**

The synthesis of thyroid hormone consists of several steps

. The first, iodide trapping, involves active (ATPdependent)

transport of iodide across the basement membrane

of the thyrocyte via an intrinsic membrane protein, the sodium/

iodine (Na+/I–) symporter. Thyroglobulin (Tg) is a large (660 kDa)

glycoprotein, which is present in thyroid follicles and has four

tyrosyl residues. The second step in thyroid hormone synthesis

involves oxidation of iodide to iodine and iodination of

tyrosine residues on Tg, to form monoiodotyrosines (MIT) and diiodotyrosines (DIT). Both processes are catalyzed by

thyroid peroxidase (TPO). A recently identified protein, pendrin,

is thought to mediate iodine efflux at the apical membrane.

The third step leads to coupling of two DIT molecules to form

tetra-iodothyronine or thyroxine (T4), and one DIT molecule

with one MIT molecule to form 3,5,3′-triiodothyronine (T3)

or 3,3′,5′-triiodothyronine reverse (rT3). When stimulated by

TSH, thyrocytes form pseudopodia, which encircle portions

of cell membrane containing Tg, which in turn, fuse with

enzyme-containing lysosomes. In the fourth step, Tg is hydrolyzed

to release free iodothyronines (T3 and T4) and mono- and

diiodotyrosines. The latter are deiodinated in the fifth step to

yield iodide, which is reused in the thyrocyte. In the euthyroid

state, T4 is produced and released entirely by the thyroid gland,

whereas only 20% of the total T3 is produced by the thyroid.

Most of the T3 is produced by peripheral deiodination (removal

of 5′-iodine from the outer ring) of T4 in the liver, muscles,

kidney, and anterior pituitary, a reaction that is catalyzed by

5′-mono-deiodinase. Some T4 is converted to rT3, the metabolically

inactive compound, by deiodination of the inner ring of T4.

In conditions such as Graves’ disease, toxic multinodular goiter,

or a stimulated thyroid gland, the proportion of T3 released

from the thyroid may be dramatically elevated. Thyroid hormones

are transported in serum bound to carrier proteins such

as T4-binding globulin, T4-binding prealbumin, and albumin.

Only a small fraction (0.02%) of thyroid hormone (T3 and T4)

is free (unbound) and is the physiologically active component.

T3 is the more potent of the two thyroid hormones, although

its circulating plasma level is much lower than that of T4. T3 is

less tightly bound to protein in the plasma than T4, and so it

enters tissues more readily. T3 is three to four times more active

than T4 per unit weight, with a half-life of about 1 day, compared

to approximately 7 days for T4.

The secretion of thyroid hormone is controlled by the

hypothalamic-pituitary-thyroid axis . The hypothalamus

produces a peptide, the thyrotropin-releasing hormone

(TRH), which stimulates the pituitary to release TSH

or thyrotropin. TRH reaches the pituitary via the portovenous

circulation. TSH, a 28-kDa glycopeptide, mediates iodide trapping,

secretion, and release of thyroid hormones, in addition to

increasing the cellularity and vascularity of the thyroid gland.

The TSH receptor (TSH-R) belongs to a family of G-protein–

coupled receptors that have seven transmembrane-spanning

domains and use cyclic adenosine monophosphate in the signaltransduction

pathway. TSH secretion by the anterior pituitary

is also regulated via a negative feedback loop by T4 and T3.

Because the pituitary has the ability to convert T4 to T3, the latter

is thought to be more important in this feedback control. T3 also

inhibits the release of TRH.

The thyroid gland also is capable of autoregulation, which

allows it to modify its function independent of TSH. As an

adaptation to low iodide intake, the gland preferentially synthesizes

T3 rather than T4, thereby increasing the efficiency of

secreted hormone. In situations of iodine excess, iodide transport,

peroxide generation, and synthesis and secretion of thyroid

hormones are inhibited. Excessively large doses of iodide may

lead to initial increased organification, followed by suppression,

a phenomenon called the *Wolff-Chaikoff effect*. Epinephrine

and human chorionic gonadotropin hormones stimulate thyroid

hormone production. Thus, elevated thyroid hormone levels

are found in pregnancy and gynecologic malignancies such as

hydatidiform mole. In contrast, glucocorticoids inhibit thyroidhormone production. In severely ill patients, peripheral thyroid

hormones may be reduced, without a compensatory increase in

TSH levels, giving rise to the euthyroid sick syndrome.

 **Thyroid Hormone Function.** Free thyroid hormone enters

the cell membrane by diffusion or by specific carriers and is

carried to the nuclear membrane by binding to specific proteins.

T4 is deiodinated to T3 and enters the nucleus via active

transport, where it binds to the thyroid hormone receptor. The

T3 receptor is similar to the nuclear receptors for glucocorticoids,

mineralocorticoids, estrogens, vitamin D, and retinoic

acid. In humans, two types of T3 receptor genes (α and β) are

located on chromosomes 3 and 17. Thyroid receptor expression

depends on peripheral concentrations of thyroid hormones andis tissue specific—the α form is abundant in the central nervous

system, whereas the β form predominates in the liver.

Each gene product has a ligand-independent, amino-terminal

domain; a ligand-binding, carboxy-terminal domain; and

centrally located DNA-binding regions. Binding of thyroid

hormone leads to the transcription and translation of specific

hormone-responsive genes.

Thyroid hormones affect almost every system in the body.

They are important for fetal brain development and skeletal maturation.

T3 increases oxygen consumption, basal metabolic rate,

and heat production by stimulation of Na+/K+ ATPase in various

tissues. It also has positive inotropic and chronotropic effects on

the heart by increasing transcription of the Ca2+ ATPase in thesarcoplasmic reticulum and increasing levels of β-adrenergic

receptors and concentration of G proteins. Myocardial α receptors

are decreased, and actions of catecholamines are amplified.

Thyroid hormones are responsible for maintaining the normal

hypoxic and hypercapnic drive in the respiratory center of the

brain. They also increase gastrointestinal (GI) motility, leading

to diarrhea in hyperthyroidism and constipation in hypothyroidism.

Thyroid hormones also increase bone and protein turnover

and the speed of muscle contraction and relaxation. They also

increase glycogenolysis, hepatic gluconeogenesis, intestinal

glucose absorption, and cholesterol synthesis and degradation

 **Benign Thyroid Disorders**

**Hyperthyroidism.** The clinical manifestations of hyperthyroidism

result from an excess of circulating thyroid hormone.

. It is important to distinguish disorders

such as Graves’ disease and toxic nodular goiters that result from

increased production of thyroid hormone from those disorders

that lead to a release of stored hormone from injury to the thyroid

gland (thyroiditis) or from other nonthyroid gland–related conditions.

The former disorders lead to an increase in RAI uptake

(RAIU), whereas the latter group is characterized by low RAIU.

Of these disorders, Graves’ disease, toxic multinodular goiter,

and solitary toxic nodule are most relevant to the surgeon.

***Diffuse Toxic Goiter (Graves’ Disease)*** Although originally

described by the Welsh physician Caleb Parry in a posthumous

article in 1825, this disorder is known as Graves’ disease after

Robert Graves, an Irish physician who described three patients

in 1835. Graves’ disease is by far the most common cause

of hyperthyroidism in North America, accounting for 60% to

80% of cases. It is an autoimmune disease with a strong familial

predisposition, female preponderance (5:1), and peak incidence

between the ages of 40 and 60 years. Graves’ disease

is characterized by thyrotoxicosis, diffuse goiter, and extrathyroidal

conditions including ophthalmopathy, dermopathy

(pretibial myxedema), thyroid acropachy, gynecomastia, and

other manifestations.

Solitary Thyroid Nodule

Solitary thyroid nodules are present in approximately 4% of

individuals in the United States, whereas thyroid cancer has a

much lower incidence of 40 new cases per 1 million. Therefore,

it is of utmost importance to determine which patients with solitary

thyroid nodule would benefit from surgery.

History. Details regarding the nodule, such as time of onset,

change in size, and associated symptoms such as pain, dysphagia,

dyspnea, or choking, should be elicited. Pain is an

unusual symptom and, when present, should raise suspicion

for intrathyroidal hemorrhage in a benign nodule, thyroiditis, or

malignancy. Patients with MTC may complain of a dull, aching

sensation. A history of hoarseness is worrisome, as it may be

secondary to malignant involvement of the RLNs. Most importantly,

patients should be questioned regarding risk factors for

malignancy, such as exposure to ionizing radiation and family

history of thyroid and other malignancies associated with

thyroid cancer.

*External-Beam Radiation* Low-dose therapeutic radiation has

been used to treat conditions such as tinea capitis (6.5 cGy), thymic

enlargement (100 to 400 cGy), enlarged tonsils and adenoids

(750 cGy), acne vulgaris (200 to 1500 cGy), and other conditions

such as hemangioma and scrofula. Radiation (approximately

4000 cGy) is also an integral part of the management of

patients with Hodgkin’s disease. It is now known that a history

of exposure to low-dose ionizing radiation to the thyroid gland

places the patient at increased risk for developing thyroid cancer.

The risk increases linearly from 6.5 to 2000 cGy, beyond

which the incidence declines as the radiation causes destruction

of the thyroid tissue. The risk is maximum 20 to 30 years

after exposure, but these patients require lifelong monitoring.

During the nuclear fallout from Chernobyl in 1986, 131I release

was accompanied by a marked increase in the incidence of both

benign and malignant thyroid lesions noted within 4 years of

exposure, particularly in children.16 Most thyroid carcinomas

following radiation exposure are papillary, and some of these

cancers with a solid type of histology and presence of *RET/PTC*

translocations appear to be more aggressive. In general, there

is a 40% chance that patients presenting with a thyroid nodule

and a history of radiation have thyroid cancer. Of those patients

who have thyroid cancer, the cancer is located in the dominant

nodule in 60% of patients, but in the remaining 40% of patients,

the cancer is in another nodule in the thyroid gland.

*Family History* A family history of thyroid cancer is a risk factor

for the development of both medullary and nonmedullary

thyroid cancer. Familial MTCs occur in isolation or in association

with other tumors as part of multiple endocrine neoplasia

type 2 (MEN2) syndromes. Nonmedullary thyroid cancers can

occur in association with other known familial cancer syndromes

such as Cowden’s syndrome, Werner’s syndrome (adult

progeroid syndrome), and familial adenomatous polyposis

. Nonmedullary thyroid cancers can also occur

independently of these syndromes as the predominant tumors in

the families. The definition of familial nonmedullary thyroid

cancer (FNMTC) is variable across the literature; however, in

most studies, it is defined by the presence of two or more firstdegree

relatives with follicular cell–derived cancers. FNMTC is

now recognized as a distinct clinical entity associated with a

high incidence of multifocal tumors and benign thyroid nodules.

Some studies report that these patients have higher locoregional

recurrence rates and consequent shorter disease-free

survival. Several candidate loci that predispose to these tumors

have been identified, including MNG1 (14q32), thyroid carcinoma

with oxphilia (TCO, on 19p13.2), fPTC/papillary renal

neoplasia (PRN, on 1q21), NMTC (2q21), FTEN (8p23.1-p22),

and the telomere-telomerase complex.17

Physical Examination. The thyroid gland is best palpated

from behind the patient and with the neck in mild extension.

The cricoid cartilage is an important landmark, as the isthmus

is situated just below it. Nodules that are hard, gritty, or fixed

to surrounding structures such as the trachea or strap muscles

are more likely to be malignant. The cervical chain of lymph

nodes should be assessed as well as the nodes in the posterior

triangle. **Diagnostic Investigations.** An algorithm for the workup of

a solitary thyroid nodule is shown in .

***Fine-Needle Aspiration Biopsy*** FNAB has become the single

most important test in the evaluation of thyroid masses and can

be performed with or without ultrasound guidance.18 Ultrasound

guidance is recommended for nodules that are difficult to palpate,

for cystic or solid-cystic nodules that recur after the initial

aspiration, and for multinodular goiters. A 23-gauge needle is

inserted into the thyroid mass, and several passes are made while

aspirating the syringe. After releasing the suction on the syringe,

the needle is withdrawn and the cells are immediately placed on

. prelabeled dry glass slides; some are immersed in a 70% alcohol

solution while others are air dried. A sample of the aspirate is

also placed in a 90% alcohol solution for cytospin or cell pellet.

The slides are stained by Papanicolaou’s or Wright’s stains and

examined under the microscope. If a bloody aspirate is obtained,

the patient should be repositioned in a more upright position and

the biopsy repeated with a finer (25- to 30-gauge) needle.

After FNAB, the majority of nodules can be classified into

several categories that determine further management. To

address the issue of variability in the terminology of fine-needle

aspiration (FNA), the National Cancer Institute (NCI) hosted the

“NCI Thyroid Fine Needle Aspiration State of the Science

Conference,” which then defined the Bethesda criteria for

thyroid FNA.19 Accordingly, optimum cytology specimens

should have at least six follicles each containing at least 10 to 15

cells from at least two aspirates.

The FNA is classified as “nondiagnostic or unsatisfactory”

in 2% to 20% of cases and typically results from a virtually acellular

specimen, cyst fluid, or the presence of blood or clotting

artifact. The risk of malignancy in this setting ranges from 1% to

4%, and reaspiration under ultrasound guidance is recommended.

A “benign” result is obtained in 60% to 70% of thyroid FNAs.

The most common lesion in this setting is a follicular nodule

(includes adenomatoid nodule, colloid nodule, and follicular

adenoma). Other diagnoses include lymphocytic (Hashimoto’s)

thyroiditis and granulomatous thyroiditis. False-negative results are reported in up to 3% of cases, and follow-up is recommended.

A result of “atypia of unknown significance (AUS) or

follicular lesion of unknown significance (FLUS)” is obtained

in 3% to 6% of biopsies. The risk of malignancy in this scenario

is difficult to determine; however, it is thought to be in the range

of 10% to 35% for FLUS and 60% to 75% for AUS. Clinical

correlation and a repeat FNA are recommended for AUS lesions

(which often results in a more definitive interpretation), although

clinical observation or surgery may be appropriate because of

worrisome clinical or ultrasound findings. The category of

“follicular neoplasm” is intended to identify nodules that might

be follicular carcinomas. The term *suspicious for a follicular*

*neoplasm* is preferred by some laboratories for this category

because up to 35% of cases turn out not to be neoplasms but

hyperplastic proliferations of follicular cells, most commonly

those of multinodular goiter. Lobectomy is the preferred treatment

for this result, and approximately 15% to 35% of lesions

placed in this category prove to be malignant. Hurthle cell neoplasms

are also included in this category. Most papillary and other

carcinomas can be diagnosed by FNA, but the features are subtle

at times, such as in follicular variant of papillary carcinomas. If the

diagnosis is uncertain, the lesions are classified as “suspicious for

malignancy.” Lobectomy or near-total thyroidectomy is recommended

because more than 60% turn out to be malignant. This

category also includes lesions suspicious for medullary carcinoma

and lymphoma, and ancillary testing such as immunohistochemical

analysis and flow cytometry may be helpful. The risk of

malignancy in lesions classified as “malignant” by FNA is 97% to

99%, and near-total/total thyroidectomy is recommended.

***Laboratory Studies*** Most patients with thyroid nodules are

euthyroid. Determining the blood TSH level is helpful. If a

patient with a nodule is found to be hyperthyroid, the risk of

malignancy is approximately 1%. Serum Tg levels cannot differentiate

benign from malignant thyroid nodules unless the levels

are extremely high, in which case metastatic thyroid cancer

should be suspected. Tg levels are, however, useful in following

patients who have undergone total thyroidectomy for thyroid

cancer and also for serial evaluation of patients undergoing

nonoperative management of thyroid nodules. Serum calcitonin

levels should be obtained in patients with MTC or a family history

of MTC or MEN2. There is insufficient evidence to recommend

routine calcitonin testing for all nodules. All patients with

MTC should be tested for *RET* oncogene mutations and have a

24-hour urine collection with measurement of levels of vanillylmandelic

acid (VMA), metanephrine, and catecholamine

levels to rule out a coexisting pheochromocytoma. About 10%

of patients with familial MTC and MEN2A have de novo *RET*

mutations, so that their children are at risk for thyroid cancer.

***Imaging*** Ultrasound is helpful for detecting nonpalpable thyroid

nodules, differentiating solid from cystic nodules, and

identifying adjacent lymphadenopathy. Ultrasound evaluation

can identify features of a nodule that increase the a priori risk

of malignancy, such as fine stippled calcification and enlarged

regional nodes; however, a tissue diagnosis is strongly recommended

before thyroidectomy.20 Ultrasound also provides a

noninvasive and inexpensive method of following the size of

suspected benign nodules diagnosed by FNAB and for identifying

enlarged lymph nodes. Ultrasound elastography is used

to evaluate tissue stiffness noninvasively. This technique takes

advantage of the fact that malignant nodules tend to be harder

than benign nodules and thus deform less compared with the

surrounding normal thyroid parenchyma.21 Larger studies are

warranted before elastography can be routinely included in the

evaluation of thyroid nodules. CT and MRI are unnecessary in

the routine evaluation of thyroid tumors except for large, fixed,

or substernal lesions. Scanning the thyroid with 123I or 99mTc

is rarely necessary, and thyroid scanning currently is recommended

in the assessment of thyroid nodules only in patients

who have follicular thyroid nodules on FNAB and a suppressed

TSH. PET scanning does not play a major role in the primary

evaluation of thyroid nodules.

**Management.** Malignant tumors are treated by thyroidectomy,

as discussed earlier and later in this chapter in Surgical Treatment

under Malignant Thyroid Disease. Simple thyroid cysts

resolve with aspiration in about 75% of cases, although some

require a second or third aspiration. If the cyst persists after

three attempts at aspiration, unilateral thyroid lobectomy is recommended.

Lobectomy also is recommended for cysts >4 cm in

diameter or complex cysts with solid and cystic components, as

the latter have a higher incidence of malignancy (15%). When

FNAB is used in complex nodules, the solid portion should be

sampled. If a colloid nodule is diagnosed by FNAB, patients

should still be observed with serial ultrasound and Tg measurements.

If the nodule enlarges, repeat FNAB often is indicated.

Although controversial, levothyroxine in doses sufficient to

maintain a serum TSH level between 0.1 and 1.0 μU/mL may

also be administered. In areas with a high prevalence of iodine

deficiency, this can decrease nodule size and potentially prevent

the growth of new nodules. In iodine-sufficient populations, the

data are less impressive. Randomized controlled trial analyses

have shown that less than 25% of benign nodules shrink more

than 50% with TSH suppression in iodine-replete populations.

Thyroidectomy should be performed if a nodule enlarges on

TSH suppression or causes compressive symptoms, or for cosmetic

reasons. An exception to this general rule is the patient

who has had previous irradiation of the thyroid gland or has

a family history of thyroid cancer. In these patients, total or

near-total thyroidectomy is recommended because of the high

incidence of thyroid cancer and decreased reliability of FNAB

in this setting.

 **NOTE**

Thyroid nodules are a common clinical problem. Thyroid nodule is a palpably or radiologically distinct lesion from the surrounding thyroid parenchyma. There is a high risk of malignancy in STN than in multiple nodules. Because of this reason, Solitary thyroid nodules have to be treated with high degree of suspicion and plan treatment in a systematic man­ner. Solitary thyroid nodules (STN) occur in 4 - 7% of the adult population. They are more common in females (6.4%) as compared to males (1.5%). Papillary and follicular can­cer comprises the vast majority (90%) of all thyroid cancer. Further, thyroid cancers are aggressive if in children with early metastasis to the surrounding structures and to region­al lymph nodes and distant sites including lungs and bones. Aims of study were to study the incidence of malignancy in solitary nodule thyroid and to study the Age and Sex distri­bution of solitary nodule thyroid.

 **MATERIAL AND METHODS**

A study was carried out on 53 patients who were admitted and operated for solitary thyroid nodule at AL-Husain Teaching Hospital, Thi-qar, during the period of Septemper 2018 to March 2019.Sample size was based on inclusion and exclu­sion criteria.

The patients were referred to this tertiary hospital for pal­pable swellings in thyroid gland, some were picked up on routine clinical examination,as well as on ultrasonography thyroid.Patients below the age of 10 years, pregnant females, those with history of radiation exposure to neck, and those patients with family history of thyroid cancers were exclud­ed from the study. The case records of 53 solitary thyroid nodules were analyzed. The solitary thyroid nodule was a single nodule of either lobe or isthmus of the thyroid gland.

The recorded proformas included history, through clinical examination, investigations which were needed for the study including FNAC, thyroid function tests, and x -ray neck with special emphasis on the rate of growth of the swelling, any change in voice, pressure symptoms, and any clinical evi­dence of thyroid dysfunction.

GRAPHS

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| **Age** |
|  | Frequency | Percent |
| 60 | 5 | 9.4 |
| 30 | 4 | 7.5 |
| 38 | 4 | 7.5 |
| 42 | 4 | 7.5 |
| 44 | 4 | 7.5 |
| 17 | 3 | 5.7 |
| 40 | 3 | 5.7 |
| 20 | 2 | 3.8 |
| 33 | 2 | 3.8 |
| 35 | 2 | 3.8 |
| 45 | 2 | 3.8 |
| 54 | 2 | 3.8 |
| 13 | 1 | 1.9 |
| 18 | 1 | 1.9 |
| 19 | 1 | 1.9 |
| 24 | 1 | 1.9 |
| 27 | 1 | 1.9 |
| 28 | 1 | 1.9 |
| 31 | 1 | 1.9 |
| 32 | 1 | 1.9 |
| 36 | 1 | 1.9 |
| 39 | 1 | 1.9 |
| 41 | 1 | 1.9 |
| 49 | 1 | 1.9 |
| 50 | 1 | 1.9 |
| 55 | 1 | 1.9 |
| 57 | 1 | 1.9 |
| 58 | 1 | 1.9 |
| Total | 53 | 100.0 |



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| --- |
| **Gender** |
|  | Frequency | Percent |
| Female | 43 | 81.1 |
| Male | 10 | 18.9 |
| Total | 53 | 100.0 |



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| **Histology \* Fine Needle Aspiration Crosstabulation** |
|  | Fine Needle Aspiration | Total |
| (-ve) | (+poor teching) | (+ve) | (poor) |
| follicular adenoma | Count | 29 | 1 | 0 | 2 | 32 |
| % | 90.6% | 3.1% | 0.0% | 6.3% | 100.0% |
| follicular carcinoma | Count | 0 | 0 | 6 | 1 | 7 |
| % | 0.0% | 0.0% | 85.7% | 14.3% | 100.0% |
| medullary carcinoma | Count | 1 | 0 | 0 | 1 | 2 |
| % | 50.0% | 0.0% | 0.0% | 50.0% | 100.0% |
| papillary carcinoma | Count | 5 | 0 | 4 | 3 | 12 |
| % | 41.7% | 0.0% | 33.3% | 25.0% | 100.0% |
| Total | Count | 35 | 1 | 10 | 7 | 53 |
| % | 66.0% | 1.9% | 18.9% | 13.2% | 100.0% |



 **RESULTS**

10 male (18.9%) and 43 female (81.1%) patients in the age group of 13-60 and above years with palpable solitary thyroid nodule were evaluated . The percentage of STN among total surgical admissions is 1.67%. Sex distribu­tion shows majority of patients were females, with a male fe­male ratio of 1:5.3 (43 of 53), and the incidence of malignancy in STN was more in females

The incidence of malignancy in the present series is 43.7% which is comparable with other studies. In the present series, papillary carcinoma is the commonest malignancy of Soli­tary Thyroid Nodule 12 (54%) of the total of 21 malignan­cies

In this series, the prevalence of malignancy is significantly higher in patients above 60 years of age, and females had more number of malignant nodules than males . The mean age of the incidence of solitary thyroid nodule is 35.71 years.

 **DISCUSSION**

The solitary thyroid nodule is rather a common disease hav­ing an incidence of 4-7% reported in the general population and mostly benign.1,2 The major concern in such patients isthe potentiality of a thyroid nodule to malignancy.The in­cidence of thyroid malignancy in patients with a palpable nodule ranges from 11% to 20%, while according to some authors, even up to 50%.

However Stoffer et al reported that 13.8% of glands resect­ed in thyroid operation for any reason contained carcinoma**.** Many surgeons would advise routine surgical resection for every solitary thyroid nodule. Such a policy resulted in many patients undergoing unnecessary operations for what was subsequently shown to be benign thyroid disease.

It is therefore logical to propose a more selective surgical policy for patients with solitary thyroid nodules. At present, fine needle aspiration cytology (FNAC) is the most relia­ble and widely used diagnostic tool in the clinical work up of solitary thyroid nodules.

 In 1964 Veith FJ, Brooks JR, Grigsby WP, et al: reported a series of 299 patients who were found to have single thyroid nodules at the time of surgery, there was a 5:1 female to male ratio. The great majority of which were papillary adenocar­cinoma.

In another study by Dr Aimal Munir Tarrar8, et al from April 2002 to April 2003, 60 patients with clinical solitary thy­roid nodule were included Maximum malignant cases were (50%). Papillary CA was the common malignancy (50%).

G. A. Khairy10 studied on the surgical and histological data of 172 patients with solitary thyroid nodules who underwent surgery were reviewed. Thirteen point nine percent (13.9%) of patients were found to have malignancy; most of them were papillary type.

In the present series, though follicular neoplasms were more frequently seen in FNAC, after final Histopathology, papil­lary carcinomas were frequent 12 of 21, and the remaining 9 were follicular carcinomas 7 and medullary carcinoma 2

There is also a female preponderance of 81.1%, and the male to female ratiois1:5.3.The highest numbers of thyroid nod­ules were seen in the age group of 30-60 years, the mean age of patients was 35 years. The youngest patient was of 13 year.

The age distribution pattern is important as the incidence of malignancy in solitary nodule thyroid is high at both extremes of age. Hence the nodules occurring in patients younger than 20 years and older than 50 years have to be considered ma­lignant until proven otherwise.

 In 1975 Gogas JG, Skalheas GD, in their study on 1300 thy­roidectomies of which 70 had carcinoma. The incidence of malignancy in solitary nodule was9.7% the risk of malignan­cy was higher in males (9.2%) than in females (4.3%).

Md. Abul Hossain13, et al in 2014 observed that male to fe­male ratio was 1:7.and the highest number of patients with thyroid nodule were found in age group 31-40 years. The relative frequency of malignancy in solitary thyroid nodule was 28%

Naz akhtar14 et al in 2015 in their study noted that Majority of the patients i.e. 53(42.7%) were between 31-40 years. Ma­lignancy in solitary thyroid nodule shows 19(15.3%)

Ramesh babu and Madhavishyamala15 in 2015 studied on malignant incidence in solitary nodule thyroidThe female male ratio is 8:1. The peak age incidence is in 21-30yrs of age group. The incidence of malignancy being 10.83%.

 **CONCLUSION**

Results were compared with available literature reported previously

The solitary thyroid nodules were seen in very less cases of surgical admissions with 3rd decade having the peak inci­dence. There are no cases below 10 years of age. Papillary carcinoma is the commonest malignancy observed constitut­ing to 80% of the malignancies. Further studies are needed to explore the suitable cause and prevention for it .

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