

**RETROSPECTIVE STUDY OF HYPOTHYROIDISM AT JIMMA UNIVERSITY  
SPECIALIZED HOSPITAL**



**BY: - LOMINAT MECHA**

**A RESEARCH PAPER TO BE SUBMITTED TO THE DEPARTMENT OF MEDICAL  
LABORATORY SCIENCE AND PATHOLOGY, COLLEGE OF HEALTH SCIENCES,  
JIMMA UNIVERSITY, FOR THE PARTIAL FULFILMENT OF THE REQUIRMENTS  
FOR THE DEGREE OF BACHELOR SCIENCE IN MEDICAL LABORATORY  
SCIENCE**

**JUNE, 2015**

**JIMMA, ETHIOPIA**

**JIMMA UNIVERSITY  
COLLEGE OF HEALTH SCIENCES**

**DEPARTMENT OF MEDICAL LABORATORY SCIENCE AND PATHOLOGY**

**RETROSPECTIVE STUDY OF HYPOTHYROIDISM AT JIMMA UNIVERSITY  
SPECIALIZED HOSPITAL**

**BY: LOMINAT MECHA**

**ADVISOR: DR. TILAHUN YEMANE (MD, MSc)**

**JUNE, 2015**

**JIMMA, ETHIOPIA**

## **ABSTRACT**

**Background:** Thyroid diseases constitute the second most common endocrine disorder. Thyroid function tests are the most frequent endocrine tests performed by the clinic. Although hypothyroidism is one of the most common thyroid disorders that affects children with various growth and mental impairments, its prevalence in Ethiopia particularly in the present study area was not well studied.

**Objective:** To determine the prevalence of hypothyroidism in patients attending Jimma University Specialized Hospital retrospectively

**Methodology:** A retrospective study was conducted at Jimma University Specialized Hospital from March 1, 2015 to April 31, 2015. All patients of all age groups with laboratory registered thyroid function tests from September 2012 to September 2015 were recruited for the study. Demographic and laboratory data were collected using structured questionnaires. Thyroid function test results of the patients were recorded from laboratory registration. Statistical analysis of the data (Percentage and chi square) was done by using SPSS V-20 statistical software.

**Results:** A total of 222 patients attending Jimma University Specialized Hospital from September 2012 to September 2015 with thyroid function tests were included in this study. The prevalence of hypothyroidism was 7.2% (n=16) and the mean value of thyroid stimulating hormone of the study subjects was  $27.1 \pm 261.9$   $\mu$ IU/ml. Both sex and age were not associated with hypothyroidism ( $p > 0.05$ ).

**Conclusion and recommendation:** Our findings appreciate that the prevalence of hypothyroidism was significant and it was found in 7.2% of the patients attending Jimma University Specialized Hospital. Since the prevalence of hypothyroidism was significant, public health managers and decision makers should implement prevention and control strategies.

## **ACKNOWLEDGEMENT**

I would like to thank Jimma University Medical Laboratory Science and Pathology department for giving me the opportunity to conduct this research.

My gratitude also goes to my advisors Dr. Tilahun Yemane for his unreserved and valuable advice in developing this research paper.

I am very grateful for JUSH laboratory department staffs who helped me in data collection throughout the study.

Finally, I would like to thank all individuals who lent their helping hand in one or another way.

# TABLE OF CONTENTS

<b>Contents</b>	<b>page</b>
ABSTRACT.....	i
ACKNOWLEDGEMENT.....	ii
TABLE OF CONTENT.....	iii
ABBREVIATION.....	v
CHAPTER ONE: INTRODUCTION.....	1
1.1. Background.....	1
1.2. Statement of the problem.....	3
1.3. Significance of the study.....	4
CHAPTER TWO: LITERATURE REVIEW .....	5
CHAPTER THREE: OBJECTIVES .....	7
3.1. General objective .....	7
3.2. Specific objectives .....	7
CHAPTER FOUR: METHODS AND MATERIALS .....	8
4.1. Study area and period.....	8
4.2. Study design.....	8
4.3. Population .....	8
4.3.1. Source population .....	8
4.3.2. Study population .....	8
4.4. Inclusion and exclusion criteria .....	8
4.5. Sampling technique.....	9
4.6. Variables .....	9
4.6.1. Dependant variable .....	9
4.6.2. Independent variables .....	9
4.7. Datacollection .....	9
4.8. Data quality assurance .....	9
4.9. Data processing and analysis .....	9

4.10. Ethical consideration.....	9
4.11. Operational definition .....	10
4.12. Plan for dissemination of the result.....	10
CHAPTER FIVE: RESULT .....	11
5.1. Demographic data of the study participants.....	11
5.2. Thyroid function tests .....	12
5.3. The prevalence of hypothyroidism .....	12
5.4. Factors related to hypothyroidism.....	12
CHAPTER SIX: DISSCUSION .....	13
CHAPTER SEVEN: CONCLUSION AND RECOMMENDATION.....	14
7.1. Conclusion .....	14
7.2. Recommendation .....	14
REFERENCES: .....	15
ANNEX: QUESTIONNAIRE .....	17

## **ABBREVIATIONS**

**Anti-TPO:** Anti thyroid peroxidase

**T3:** tri-iodothyroxine

**T4:** thyroxin

**JUSH:** Jimma University Specialized hospital

**TSH:** Thyroid stimulating hormone

# CHAPTER ONE

## 1. INTRODUCTION

### 1.1. Background

Evolution of thyroid function is frequently carried out, in part because thyroid diseases constitute the second most common endocrine disorder after diabetes mellitus. Clinical investigations and recent commercial developments have made a plethora of laboratory tests available for assessment of thyroid dysfunction (1).

Thyroid tests are often used to screen thyroid function, assess adequacy of therapy, and monitor treatment of differentiated thyroid cancer. In Singapore, some 4–7% of the population have a thyroid disorder and constitute up to one-third of all endocrine referrals in restructured hospitals. About 90% of patients in Singapore suffer from hyperthyroidism and the remaining 10% suffer from hypothyroidism, with Chinese women at higher risk for hyperthyroidism and Indian ethnic group at higher risk for hypothyroidism. The clinical presentation of thyroid disease is quite diverse thus accurate laboratory assessment is vital. Besides, patients may require long-term (anti-thyroid drugs) or life-long (thyroid hormones) medications or ablative therapy (radioiodine or surgery). Thyroid testing constitutes the most frequent endocrine tests performed by the clinical laboratory (2).

Almost one-third of the world's population lives in areas of iodine deficiency, in areas where the daily iodine intake is below 50 µg, goiter is usually endemic, and when the daily intake falls below 25 µg, hypothyroidism is seen. The prevalence of goiter in areas of severe iodine deficiency can be as high as 80%. Population at particular risk tend to be remote and live in mountainous areas in South- East Asia, Latin America and Central Africa. Iodization programs are of proven value in reducing goiter size and in preventing goiter development and cretinism in children. Goitrogens in the diet , such as thiocyanate in incompletely cooked Cassava or thioglucosides in Brassica vegetables, can explain some of the differences in the prevalence of endemic goiter in areas with similar degrees of iodine deficiency (3).



Prevalence of hypothyroidism in the reproductive age group is 2–4% and has been shown to be the cause of infertility and habitual abortion (4, 5) (8, 9). The most common test and the starting point in any investigation of thyroid diseases is thyroid stimulating hormone (TSH). Other common tests include thyroxin (T4), tri-iodothyronine (T3) and Anti Thyroid Peroxidase (Anti-TPO), sometimes referred to as Anti-Thyroid Antibody (4, 5).

## **1.2. Statement of the problem**

Thyroid problems (disorders) have been reported in over 110 countries of the world with 1.6 billion people at risk and need some form of iron supplementation. Most of these are in developing countries, Asia, Africa and Latin America. In Pakistan about 20 million people live in iodine deficient areas, 8 million of them shows some form of iodine deficiency and at least 1 million have mental disorders. Thyroid disorders are due to abnormality in thyroid functions and enlargement of the thyroid gland. The major disorders of thyroid glands are over secretion (hyperthyroidism) and under secretion (hypothyroidism) of thyroid hormones. Both situations lead to thyroid problems.

Hypothyroidism, which is the most common manifestation of iodine deficiency, is very common. The prevalence of hypothyroidism in some areas reaches 5–15%. In iodine-replete communities, the prevalence of spontaneous hypothyroidism is between 1 % and 2 %, and it is more common in older women and ten times more common in women than in men (6). The prevalence of overt hypothyroidism in Northern Europe, Japan and the USA was in the range between 0.6 and 12 per 1000 women and between 1.3 and 4.0 per 1000 in men (7, 8). The prevalence of hypothyroidism and sub-clinical hypothyroidism in Pakistan was 4.0% and 5.4%, respectively (9).

Congenital hypothyroidism affects about one newborn in 3,500 to 4,000 births and is the most treatable cause of mental retardation. There is an inverse relationship between age at diagnosis and intelligence quotient (IQ) in later life. In iodine-replete areas, 85 % of the cases are due to sporadic developmental defects of the thyroid gland (thyroid dysgenesis) such as the arrested migration of the embryonic thyroid (ectopic thyroid) or a complete absence of thyroid tissue (athyreosis). The remaining 15 % have thyroid dysmorphogenesis defects transmitted by an autosomal recessive mode of inheritance (10).

Since the prevalence of hypothyroidism in patients with thyroid function tests at JUSH was not known, this study was sought to determine the prevalence of hypothyroidism in patients attending Jimma University Specialized Hospital retrospectively over 3-years period from September 2012 to September 2015.

### **1.3. Significance of the study**

The findings of this study can be used by clinicians, doctors, policy makers and NGOs to control, treat and prevent thyroid disorders and associated complications. The finding could also bridge the gap on the prevalence of hypothyroidism in Ethiopia particularly in the present study area.

## CHAPTER TWO: LITERATURE REVIEW

A cross sectional study conducted on the prevalence of abnormal thyroid function in Colorado, United States in 1995 showed that the prevalence of hypothyroidism was 9.5% (2450/25862), most of whom were subclinical hypothyroidism (95%, 2336/2450). Percentage of hypothyroidism ranged from 4% to 21% in women and from 3% to 16% in men. The percentage of subjects with hypothyroidism was greater for women than men in various age categories, reaching statistical significance for each categories after age 34 years ( $p < 0.01$ ). Subclinical hypothyroidism was more common among women ( $p < 0.001$ ). There were 570 (2.2%) participants with a low TSH concentration (11).

A cross sectional population based study conducted on the prevalence of thyroid disorders among older peoples in Sao Paulo, Brazil from may 2003 to April 2005 showed that the prevalence of hypothyroidism was 12.2% (167/1373) and 53.3% (89/167) of whom were subclinical hypothyroidism and the remaining 46.7% (78/167) were overt hypothyroidism. The prevalence of hypothyroidism in females and males was 12.6% (105/835) and 11.5% (62/538), respectively. The mean age of peoples with hypothyroidism was 71.8 years (12).

A cross sectional multicenter study conducted on the prevalence of hypothyroidism in adults in India from March to July 2011 showed that the prevalence of hypothyroidism was 10.95% (587/5360) of which 3.47% ( $n = 186$ ) were previously undetected and 7.48% ( $n = 401$ ) were self-reported cases. Out of these 401 self reported cases accurate dosing details of thyroxine therapy were available with 379 patients. Among these 379 patients 272 (71.77%) had a TSH  $< 5.5$   $\mu\text{IU/mL}$  on a mean dose of 1.19 mcg/kg, while the remaining ( $n = 107$ , 28.23%) had a TSH  $> 5.5$   $\mu\text{IU/mL}$  on a mean dose of 1.10 mcg/kg. Out of the 5360 analyzable subjects, 2932 (54.70%) were females. The mean age of the study subjects was 45.85 with a range of 18 to 100 years (13).

A descriptive study conducted on the pattern of thyroid disorders in southwestern region of Nigeria from June 2004 to August 2005 showed that the prevalence of thyroid disorders was

1.6% (78/4800); out of which 7% (5/78) had hypothyroidism, 84% (63/78) had Graves disease/hyperthyroidism, and 9% (10/78) had euthyroid. The female-to-male ratio of the subjects with hypothyroidism was 3:2, and their mean age was 40 years. Goiters were palpable in all subjects with hypothyroidism save one with congenital hypothyroidism. A total of 4800 cases were seen during the study period, out of which 0.1% (5/4800) had hypothyroidism (14).

A study was conducted on thyroid dysfunction and goiter among immigrants in Ethiopia. A total of 1131 immigrants from Gonder, Ethiopia were surveyed a year after arrival in Israel. The study showed that the prevalence of hypothyroidism was 1.1%, 2% in children and 0.2% in adults (15).

## **CHAPTER THREE: OBJECTIVES**

### **3.1. General objective**

To determine the prevalence of hypothyroidism and factors related to hypothyroidism in patients attending Jimma University Specialized Hospital retrospectively.

### **3.2. Specific objectives**

- To determine the prevalence of hypothyroidism in patients attending JUSH
- To identify factors related to hypothyroidism

## **CHAPTER FOUR: METHODS AND MATERIALS**

### **4.1. Study area and period**

The study was conducted at Jimma University Specialized Hospital (JUSH) from March 1, 2015 to April 31, 2015. JUSH is located 357kms southwest of Addis Ababa. It is found in Jimma town of Oromia regional state. It is one of the oldest teaching hospitals in the country giving services to people living in Jimma zone, surrounding zones and woredas from Gambela and southern Ethiopia, serving as the only referral hospital in the southwest Ethiopia and giving services for over 15 million catchment population. It is a teaching hospital for undergraduate medical, health officer, midwifery and other health science students. It is also serving as a clinical post graduate specialty teaching hospital for major clinical disciplines since 2007.

### **4.2. Study design**

Retrospective cross section study design was used to conduct this study.

### **4.3. Population**

#### **4.3.1. Source population**

All patients with thyroid function tests registered on JUSH laboratory registration were the source population.

#### **4.3.2. Study population**

The study population was patients registered on JUSH laboratory registration with diagnosis of hypothyroidism.

### **4.4. Inclusion and exclusion criteria**

#### **Inclusion criteria**

All age group patients of both sexes registered on JUSH laboratory registration with a diagnosis of hypothyroidism.

#### **Exclusion criteria**

- Patients without complete socio-demographic and laboratory data.

## **4.5. Sampling technique**

All patients registered on laboratory registration between September 2012 and September 2015 with a diagnosis of hypothyroidism were included consecutively as a study subjects.

## **4.6. Variables**

### **4.6.1. Dependant variable**

- Thyroid function tests

### **4.6.2. Independent variables**

- Age
- Sex

## **4.7. Datacollection**

Patient demographic and laboratory data was collected using structured questionnaire.

## **4.8. Data quality assurance**

To assure the quality of the data 10% of the questionnaire was pre-tested before the actual data collection.

## **4.9. Data processing and analysis**

Data was edited, cleaned and checked for its completeness before entering the data. Descriptive statistical tests will be used for analysis of demographic and laboratory data. Categorical variables were compared using chi-square ( $\chi^2$ ) test. A level of statistical significance (two sided) was set at  $p < 0.05$ . All statistical analysis was done by using SPSS V-20.0 (SPSS Inc., Chicago, IL) statistical software.

## **4.10. Ethical consideration**

Ethical clearance was obtained from Jimma University, ethical review board and supporting letter will be obtained from Jimma University, department of medical laboratory sciences and pathology as well as from JUSH medical director. The purpose of the study was clearly described to the medical director of JUSH and head of laboratory department. Any information concerning the patients was kept confidential.



#### **4.11. Operational definition**

- Hypothyroidism: Thyroid stimulating hormone (TSH) level  $>5.1$  mIU/L and T4 level  $<57.9$  nmol/L [or  $<4.5\mu\text{g/dL}$ ] (11).

#### **4.12. Plan for dissemination of the result**

The results will be presented to Jimma university scientific community in thesis defense. After that the final report will be disseminated to the Oromia Regional Health Bureau and JUSH so that the findings of this study will be used by policy makers, clinicians and other health professionals for management, prevention and control of hypothyroidism and its complications.

## CHAPTER FIVE: RESULT

### 5.1. Demographic data of the study participants

A total of 222 patients attending Jimma University Specialized Hospital from September 2012 to September 2015 with thyroid function tests were included in this study. Of these, 15.3% (n=188) were females and 84.7% (n=34) were males with mean age of  $35.2 \pm 13.8$  years. The highest numbers of participants were within the age group of 18-30 years with 47.3% (n=105) (Table 1).

**Table 1.** Demographic data of patients with thyroid function tests at JUSH, Southwest Ethiopia, from September 2012 to September, 2015.

<b>Variables</b>	<b>No (%)</b>
<b>Age (years)</b>	
<18	9 (4)
18–30	105 (47.3)
31–40	39 (17.4)
41–50	38 (17.3)
51–60	25 (11.3)
61–70	6 (2.7)
<b>Sex</b>	
Male	34 (84.7)
Female	188 (15.3)
<b>Total</b>	<b>222 (100)</b>

Key: No- number, %- percentage

## 5.2. Thyroid function tests

The mean value of TSH of the study subjects was 27.1  $\mu$ IU/ml (Table 2).

Table 2. The mean value of thyroid function tests of patients at JUSH, Southwest Ethiopia, from September 2012 to September 2015.

Parameters	Mean	SD
Thyroid-stimulating hormone ( $\mu$ IU/ml)	27.1	261.9
T4	123.41	213.45
T3	5.43	18.23

Key: T4- Total thyroxine , T3- Tri-iodothyronine, SD- standard deviation, TSH, Thyroid-stimulating hormone

## 5.3. The prevalence of hypothyroidism

The prevalence of hypothyroidism was 7.2% (n=16).

## 5.4. Factors related to hypothyroidism

Both age ( $\chi^2=9.477$ ,  $p=0.091$ ) and sex ( $\chi^2=1.748$ ,  $p=0.186$ ) were not associated with hypothyroidism (Table 2).

Table 2. Factors related to hypothyroidism in patients with thyroid function tests at JUSH, Southwest Ethiopia, from September 2012 to September 2015.

Variables	Hypothyroidism		Total	X <sup>2</sup> -TEST	P-value
	Yes (n)	No (n)			
<b>Age (years)</b>					
<18 (reference)	1	8	9	9.477	0.091
18–30	10	94	104		
31–40	0	46	46		
41–50	5	30	35		
51–60	0	24	24		
61–70	0	4	4		
<b>Sex</b>				1.748	0.186
Male (reference)	4	27	31		
Female	12	179	191		

Key: P-Value < 0.05 is considered as significant

## **CHAPTER SIX: DISSCUSION**

In this facility-based retrospective study which was conducted at Jimma University Specialized Hospital, 222 patients with thyroid function tests were involved. The prevalence of hypothyroidism was 7.2% Sex was significantly associated with hypothyroidism as females were at higher risk of having hypothyroidism when compared to males.

In this study hypothyroidism was found in 7.2% (n=16) of the study subjects. This finding is relatively similar with a study done in southwestern region of Nigeria which found 7% prevalence of hypothyroidism (14). However, our finding is higher than study done in Gondar which was 1.1% (15) and slightly lower than studies done in Colorado United States, Brazil and India which found 9.5% (11), 12.2% (12) and 10.95 (13) prevalence of hypothyroidism, respectively. This difference may be explained by differences in geographical areas, in iodine supplementation coverage and in study subjects.

The finding of our study also showed that both age ( $p=0.091$ ) and sex ( $p=1.86$ ) were not associated with hypothyroidism. Our finding was in line with a study done in Brazil (12), but is discordant with studies done in United States (11) and southwestern region of Nigeria (14). This difference could be due to differences in geographical areas and study subjects.

## **CHAPTER SEVEN: CONCLUSION AND RECOMMENDATION**

### **7.1. Conclusion**

Our finding appreciates that the prevalence of hypothyroidism was significant and it was found in 7.2 % of the patients attending Jimma University Specialized Hospital. Both age and sex were not associated with hypothyroidism.

### **7.2. Recommendation**

Based on the study finding the following recommendations are suggested:

- Since one out of thirteen patients with thyroid function tests had hypothyroidism, early recognition and management of patients with hypothyroidism can assist in preventing its complications.
- Since the prevalence of hypothyroidism was significant public health managers and decision makers should implement prevention and control strategies

## REFERENCES

1. L. Bartalena, F. Bogazzi and A. Pinchera. Thyroid function tests and diagnostic protocols for investigation of thyroid dysfunction. *Ann. 1<sup>st</sup> Super Sanita*. 1991, 27 (3):531-540.
2. Thyroid Function Tests. Tar Choon Aw, FrCP (Edin), FrCPa, Clementine YF Yap, Mt(asCP), DLM (asCP); *Proceedings of Singapore Healthcare*. 2011, 20(2):132-134.
3. Zimmermann MB, Jooste PL, Pandav CS. Iodine deficiency disorders. *Lancet*. 2008, 372:1251-1262.
4. Lincoln R, Ke Rw, Kutteh WH. Screening for hypothyroidism in infertile women. *J Reprod Med*. 199, 44:455-57.
5. Krassas GE. Thyroid disease and female reproduction. *Fertil Steril* 2000, 74:1063-70.
6. Alam Khan, M. Muzaffar Ali Khan and Shamim Akhtar. Thyroid disorders, etiology and prevalence. *J Med Sci*. 2002, 2(2):89-94.
7. Laurberg P., Bulow P.I., Knudsen N., Ovesen L., Andersen S. Environmental iodine intake affects the type of non-malignant thyroid disease. *Thyroid*. 2001, 11:457-469.
8. Vanderpump MPJ. The epidemiology of thyroid diseases. *A Fundamental and Clinical Text*. 2005, 9<sup>th</sup> ed, pp 398-406. JB Lippincott-Raven, Philadelphia.
9. Akhtar S., A Khan, M. M. Siddiqui and Gul Nawab. Frequencies of thyroid problems in different age, sex and seasons. *The Sciences*. 2001, 1:153-156.
10. Mark PJ Vanderpump. *Epidemiology of Thyroid Dysfunction –Hypothyroidism*. *Thyroid International*. 2009, 2<sup>nd</sup> ed.
11. Canaris GJ, Manowitz NR, Mayor G, Ridgway EC. The Colorado Thyroid Disease Prevalence Study. *Arch Intern Med*. 2000, 160:526-534.
12. Benseñor IM et al. Prevalence of thyroid disorders among older people: results from the São Paulo Ageing & Health Study. *Cad. Saúde Pública*, Rio de Janeiro. 2011, 27(1):155-161.

13. Ambika Gopalakrishnan Unnikrishnan, Sanjay Kalra, Rakesh Kumar Sahay, Ganapathi Bantwal, Mathew John, and Neeraj Tewari. Prevalence of hypothyroidism in adults: An epidemiological study in eight cities of India. *Indian J Endocrinol Metab.* 2013; 17(4): 647–652.
14. A. O. Ogbera, O. Fasanmade, and O. Adediran. Pattern of thyroid disorders in the southwestern region of Nigeria. *Ethn Dis.* 2007;17:327–330.
15. Luboshitzky R, Dqani Y, Atar S, Qupty G, Rakover Y, Tamir A, and Flatau E. Thyroid dysfunction and goiter among immigrants from Ethiopia. *Harefuah,* 1994;127(9):289-93.

# ANNEX: QUESTIONNAIRE

Jimma University

College of public health and medical sciences

Department of medical laboratory science and pathology

A research questionnaire

Name of the patient \_\_\_\_\_ Card number \_\_\_\_\_

Code number \_\_\_\_\_ Date \_\_\_\_\_

## PART 1. Demographic data

01. Age in years:

02. Sex: 1. Male

2. Female

03. Place of residence

## PART 2. Laboratory data

01. Thyroid stimulating hormone (TSH) ( $\mu$ IU/L):

02. thyroxin (T4) (nmol/L):

03. tri-iodothyronine (T3) (nmol/L):