Research Article

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Frequency and Factors Associated with Thyroid Dysfunction: an Analytical Crosssectional Study from a Tertiary Care Center in Kabul, Afghanistan

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Abstract

Background

Endocrinopathies are a commonly occurring entity, particularly those of the thyroid gland, however there is lack of scientific literature from Afghanistan, a country with very limited health care facilities and resources. This is the first study aimed to describe the frequency of occurrence and factor associated with thyroid dysfunction in Afghan population. The aim of this study is to estimate the frequency and to identify factors associated with thyroid dysfunction. among individuals coming to a tertiary care facility in Kabul, Afghanistan.

Methods

A cross-sectional study was conducted from July to Sep 2018 at the Department of Clinical Pathology, French Medical Institute for Mothers and Children (FMIC), Kabul, Afghanistan. Blood samples were obtained, serum TSH, levels were analyzed, and the patients were divided into three diagnostic categories according to their serum TSH concentrations, 1) Hypothyroidism 2) Hyperthyroidism 3) normal.

Results

A total of 127 individuals were included in the final analysis. Majority study participants (77%) were females. A large number of the participants (92%) did not have family history of thyroid dysfunction. (74%) participants in the study had normal TSH levels classified as normal thyroid function, (14%) had lower TSH levels and (12%) higher TSH, levels (Table 1) classified as hyper and hypothyroid respectively.

Conclusion

The findings of the current study showed a high frequency of thyroid dysfunctions from a single center. Further large scale studies are needed to find out the prevalence and document this entity for better health outcomes in the country.

Keywords: Thyroid, Thyroid Stimulating Hormone, Hypothyroid, Hyperthyroid, Afghanistan, Factors, Frequency.

Introduction

The thyroid secretes two most important hormones, thyroxine and triiodothyronine, usually called T4 and T3, correspondingly. These hormones greatly increase the metabolic rate of the body [1].

The thyroid stimulating hormone [TSH], secreted by the thyrotropin cells of the anterior pituitary, plays a central role in control of the thyroid axis and serves as the most useful physiologic indicator of thyroid hormone action [2].

TSH is a 31-kDa hormone having two subunits [α and β]; the α subunit is common to the other glycoprotein hormones (luteinizing hormone, follicle stimulating hormone, human chorionic gonadotropin [hCG]), but the TSH β subunit is unique to TSH. The amount and nature of carbohydrate modification are modulated by thyrotropin-releasing hormone (TRH) stimulation and affect the biologic activity of the hormone [3].

Regarding the laboratory assessment of the patient with known or suspected thyroid illness, the doctor had better seek to arrive

at both functional and anatomic diagnoses. Laboratory tests will ratify if there is an excess, normal, or an inadequate supply of thyroid hormone to confirm the implications from the clinical history and physical examination. The second is to determine the existence or nonexistence of anatomic anomalies in the thyroid gland itself. Laboratory tests for thyroid assessment can be divided into two main classes including tests that evaluate the state of the hypothalamic-pituitary-thyroid axis such as TSH followed by estimation of the free T4 or T3 concentrations in the serum for confirmation [4].

Hypothyroidism is not rare, affecting more than 1% of the general population and about 5% of persons over age 60 years. Thyroid hormone deficiency disturbs almost all body functions. The severity ranges from mild hypothyroid states to prominent myxedema. Other causes of hypothyroidism might be failure or resection of the thyroid gland itself or deficiency of TSH secretion from pituitary gland [5].

From a clinical perspective, hyperthyroidism is a hyper metabolic condition resulting from excessive production of thyroid hormones. Furthermore, women are more susceptible to developing hyperthyroidism than men are. For laboratory investigation of primary hyperthyroidism, it is better to estimate the concentration of TSH which is suppressed and the serum FT4 concentration will be elevated [6].

Finding a low TSH and an elevated FT4 concentrations are usually sufficient enough to establish the diagnosis of hyperthyroidism in the setting of well-matched clinical features. Whenever the TSH concentration is low but the FT4 concentration is within the reference range, T3 concentration should be measured. Furthermore, a persistently repressed concentration of serum TSH with normal concentrations of serum T3 and FT4 describe subclinical hyperthyroidism [7].

However, as advocated by most studies assessment of TSH is the single most suitable test of thyroid function in the vast majority of patients. In most cases the TSH will be within the reference interval, and no further testing is required [8].

Thus to summarize, hypo and hyperthyroidism are common endocrine disorders and TSH serves as a primary clue, especially in resource constrained set up like Afghanistan, where diagnostic and health care facilities are meagre and financial constraints further impose barriers [9].

With all these obstacles and constraints in context, this is the first study aimed to describe the frequency of occurrence and factor associated with thyroid dysfunction in a native Afghan population using serum TSH as a screening test. As thyroid dysfunctions is linked with many complications and morbidities. Early screening using TSH, prompt further evaluation and treatment can prevent these complications and morbidities [10].

Methods

The study used an 'Analytical Cross-sectional' design to assess frequency and factors associated with thyroid dysfunction among individuals coming to Clinical Laboratory of French Medical Institute for Mothers and Children [FMIC], a high quality and tertiary healthcare center in Afghanistan from July to September 2018.

FMIC was established in 2005 and is the first healthcare facility in Afghanistan which achieved ISO 9001: 2008 certificate in 2009. FMIC's Clinical laboratory is considered the best in the region for providing high quality services. A non-probability consecutive sampling was used to recruit study participants. The study was approved by the Ministry of Public Health [MoPH] Afghanistan and French Medical Institute for Mothers and Children (ERC# 20-FMIC-ER-18). An informed consent was received from the study participants and they were informed about study purpose in detail.

All the individuals who came to Clinical Laboratory of FMIC for serum TSH test during the study period were included. Patients who were already diagnosed having any thyroid dysfunctions, patients taking thyroxin, patients who have had thyroid surgery, patient who were taking antithyroid medicines and patients who were suffering from chronic diseases such as hypertension, diabetes mellitus and cardiac disorders were excluded from the study.

Data was collected by the principal investigator using a structured questionnaire via one to one interview. Questionnaire comprised of inforamtion regariding contact number, age, sex, province,medical history,history of drug use,pregnancy and smoking. The questionnaire was originally developed in English language, translated into Dari [regional language] for appropriate comprehension.5 ml of blood was obtained from each participant at the time of visit, by qualified phlebotomist using standardized tubes, with standard precaution. The blood sample tube was centrifuged and serum TSH were measured by direct chemiluminescence immunoassay on automated immune analyzer ADVIA Centaur (Siemens Diagnsotics USA). TSH was categorized as higher TSH level> 4.2 mIU/L, lower TSH level < 0.4 mIU/L and normal TSH level 0.4 to 4.2 mIU/L.
Descriptive and inferential statistics were used for data analysis. Statistical analysis was done using Statistical Package for the Social Science (SPSS) version 21. Proportions and frequencies were computed for categorical variables. Means and standard deviations were computed for continuous variables. Median was calculated for variable following non normal distribution.

Level of TSH was computed as variable and proportion was reported. In order to determine the relationship of independent variables with TSH level, Chi-square test of independence was run. A p-value of less than 0.05 was considered statistically significant.

Results

Table 1: Demographic characteristics of participants (Percentages are rounded off to the nearest digit)

Variable	(N=127)	Percentage (%)
Age Group		
21-30	81	64
31-54	46	36
Gender		
Male	29	23
Female	98	77
Family History		
Yes	10	8
No	117	92
Pregnancy in last 2 years		
Yes	14	15
No	82	85
Abortion in last 2 years		
Yes	13	14
No	83	86
Smoking		
Yes	3	2
No	124	98

Describes the characteristics of the study participants. Overall 170 individuals participated during the study period (July to September 2018). Out of total, 43 of the participants, according to exclusion criteria, were excluded from the study and hence a total of 127 individuals were part of the sample for the final analysis.

Majority study participants (77%) were females. A large number of the participants (92%) did not have family history of thyroid dysfunction and majority of the female participants, (85%) were not pregnant in the last two years.

Furthermore, a 98% participants, were non-smokers. The categories were formed using the reference ranges of the adult patients as the age of participants in the study ranged from 21 years to 54 years. 74% participants in the study had normal TSH levels classified as normal thyroid function, [14%] had lower TSH levels and [12%] higher TSH levels [Table 1] classified as hyper and hypothyroid respectively, depicted in Fig 1.

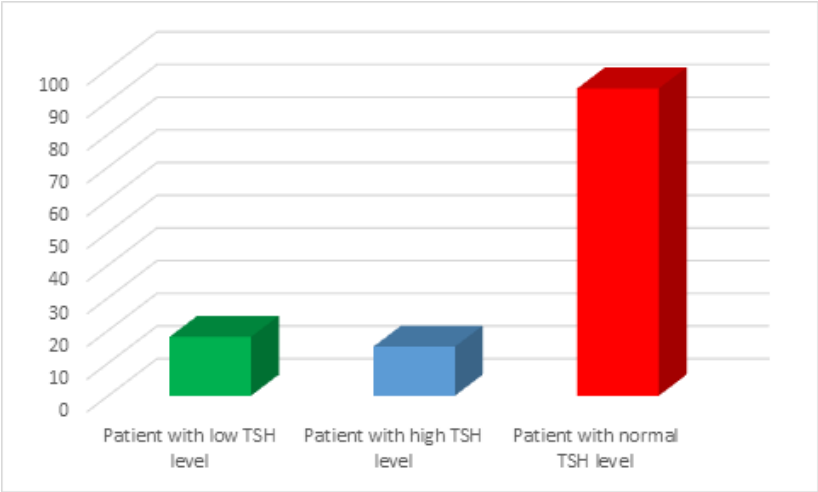

Figure 1: Distribution of TSH level among the study participants

Table 2 describes the association between plausible independent variables and thyroid dysfunction (levels of TSH). Factors such as age (p-value=0.02) and smoking (p-value=0.016) status were found to have statistically significant association with the thyroid dysfunction. However, gender, family history and pregnancy showed an insignificant association with thyroid dysfunction. The inferential statistics are summarized in table 2.

Table 2: Inferential statistics for the association between TSH level and other variables

Variable	Patient with low TSH level	Patient with high TSH level	Patient with normal TSH level	p -value*
Gender				0.6
Male	5	2	22	
Female	13	13	72	
Age				0.02
21-30	12	5	59	
31-54	6	9	31	
Family History of thyroid dysfunction				0.3
Yes	3	1	6	
No	15	14	88	
Smoking				0.016
Yes	1	2	0	
No	14	16	94	
Pregnancy in last 2 years				0.141
	8	2	4	
Yes	62	11	9	
No				

*Fisher Exact test p-value

Discussion

The current study findings revealed that a considerable percentage of the participants had thyroid dysfunctions, [14%] had lower TSH levels which mean hyperthyroidism and [12%] had higher TSH levels which means hypothyroidism. Literature has also supported high prevalence of thyroid dysfunction among patients in developed as well as developing countries. It has been estimated that about 42 million people in India suffer from thyroid dysfunction, in addition, studies from Mumbai have suggested that congenital hypothyroidism is common in India, the disease occurring in 1 out of 2640 neonates, when compared with the worldwide average value of 1 in 3800 subjects [11].

Hypothyroidism is a commonly prevailing disorder in adult Indian population as well (12). Moreover, a recent study conducted in Iran reported higher incidence rate of thyroid disorders than previous studies [13].

Similarly, According to a survey, which was conducted in Whickham in order to determine the prevalence of thyroid dysfunction in the community it was revealed that thyroid dysfunction affects 1-2% adult population of the Great Britain [14].

Likewise, in the current study, researcher found a significant association between age and thyroid dysfunction [p-value 0.02]. Individuals with age (931-54 years) were more prone to thyroid dysfunction compare to younger individuals with age (21-30 years). Similar finding was found in another study which was conducted in Greece, in which the author found a strong association between aging and decrease TSH and T3 levels while serum FT4 levels were normal [15].

In addition, smoking was found to have a significant relation with thyroid dysfunction (p-value 0.016). None of the individuals with normal TSH level were smokers, 2 persons of the patients with higher TSH level were smoking and 1 person of the patient with lower TSH level was smoking. Literature also supports the current findings of the study suggesting that smoking cessation is effective in primary, secondary and tertiary prevention of thyroid disorders [16].

On the contrary, another study conducted by Cari M. Kitahara found that cigarette smoking is associated with reduced risks of papillary thyroid cancer and, probably, follicular thyroid cancer [17].

Furthermore, this study did not reveal any significant relation between family history and thyroid dysfunctions, which is differing from the literature that indicates strong association between family history and thyroid dysfunctions. In a multicenter cohort study which was conducted in United Kingdom about half of all the subjects reported a family history of thyroid dysfunction [18].

In addition to being the first report from Afghanistan, there were a few limitations of this study, mainly the TSH only approach which could lead to potential confounders. The data of this study is limited to those individuals who visited FMIC; thus limiting the generalizability of the results. Furthermore, the use of questions regarding family history from the subjects may have possible recall bias.

The findings recommend screening and investigation for thyroid dysfunctions in Afghan population at high risk for thyroid disorders (smokers, elder people, especially pregnant women and neonates as neonatal thyroid disorders cause irreversible complications).

Conclusions

The current study showed a high frequency of thyroid dysfunctions in individuals at a single center in a short span of time. The findings also indicated that aging and smoking are the factors associated with thyroid dysfunctions. Further studies are needed to find out the prevalence of and factors associated with thyroid dysfunctions for appropriate and timely interventions in resource constrained environment of Afghanistan.

Abbreviations

TSH: Thyroid Stimulating Hormone, T3: Triiodothyronine, T4: Thyroxine, FT4: Free Thyroxine, FMIC: French Medical Institute for Mothers and Children, MoPH: Ministry of Public Health, hCG: Human Chorionic Gonadotropin, SPSS: Statistical Package for the Social Science ERC: Ethical Review Committee.

Declarations

Ethics Approval and Consent Form

This study was approved by the Ethical Review Committee of FMIC (20-FMIC-ER-18) and Consent form was signed by all the study participants.

Consent for Publication

Written consent for publication was taken from all the participants.

Availability of Data and Materials

All data generated or analyzed during this study are included in this published article

Competing interests: The authors declare that they have no competing interests.

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Authors' Contributions

MNL conceived the idea and collected the data. Data were analyzed by AG. SA was the major contributor to the writing of the manuscript. AMH was the major contributor for critically revising the manuscript for important intellectual content. Dr. Jamshid Jalal has given expert opinion and final approval of the version to be published.

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