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Original Research

A Study on the Prevalence of Thyroid Disorders Associated with Age and Sex in Derna, Libya

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ABSTRACT:

This study aims to determine the prevalence of thyroid dysfunction and its association with age and sex in the population of Derna City. In this retrospective cross-sectional study, we screened 5191 suspicious cases of thyroid diseases within two years from January 1, 2021, to December 31, 2022, retrieving the data about thyroid function test (TFT) including serum concentrations of TSH, Triiodothyronine (T3), Thyroxine (T4), from the computers of nine clinical laboratories of Derna City. The prevalence of thyroid dysfunction was determined in

terms of number and percentage. Comparisons of the prevalence of thyroid abnormalities in subjects of different age groups and genders were determined in cross-tabulation. We concluded that thyroid diseases affect women more than men and increase with age. Also, the most prevalent type was hypothyroidism especially subclinical.

KEYWORDS: Prevalence Thyroid Disorders; Age; Sex; Derna City.

INTRODUCTION

Thyroid diseases are one of the most prevalent endocrine disorders second to diabetes mellitus (Ahmad et al., 2016). The total frequency of these diseases is estimated to be 200 million worldwide (Mansoor et al., 2011). The thyroid gland is the master gland to controls the body's metabolism, growth, development and conservation of internal homeostasis. Response to TSH from the pituitary gland which in turn is under the control of thyrotropin hormone (TRH) from the hypothalamus thyroid gland secretes its hormones (T3 and T4). It secretes 93% of thyroxin (T4) and 7% tri-iodothyronin (T3), Compared to T4, T3 is around ten times more active (Lynn and Lynn, 2007).

Iodine, a mineral that is normally found in meals in iodized form, is necessary for the gland to release these hormones (Leung et al., 2010). A small proportion of thyroid hormones are found free in the blood. most of them are bound to thyroxin- binding globulin (TBG) (75%), prealbumin and albumin (15%) (Alshehri et al., 2015). Only free 0.03% of T4 and 0.3% of T3 are fractions that are biologically active. In addition, Iodothyroninedeiodinases in certain body organs convert T4 to T3 up to 80 percent in the blood (Bianco et al., 2014). These hormones increase the transcription of several genes, known to affect catabolism. Thyroid hormone initiates a chain of molecular events or gene expressions when the active form of the hormone interacts with specific cell receptors and subcellular factors of colorful organs (Lynn and Lynn, 2007).

Thyroid diseases are classified into two major orders; hypothyroidism and hyperthyroidism which are further sub-classified into overt and subclinical types. Overt hypothyroidism is defined as a decline in serum levels of T3 and T4 in the presence of elevated serum TSH, while Subclinical hypothyroidism occurs when serum TSH levels are slightly elevated but T3 and T4 serum levels are normal. Whereas, Overt hyperthyroidism is characterized by low serum TSH levels and elevated free serum T3 or T4 levels. In contrast, subclinical hyperthyroidism is defined as low serum TSH levels and normal triiodothyronine (T3) and thyroid hormone (T4) or thyroxine levels (Vanderpump, 2011).

Gender and age are primary factors that affect the frequency and prevalence of thyroid diseases. Thyroid diseases are more

predominant in ladies than men and in grown-ups compared with youngish age groups (Cappola and Ladenson, 2003). A routine of examinations that can be applied to examine the subroutine of the thyroid, for the presence of conditions, and the success or failure of converse. Blood tests in general point to estimate thyroid function or impact the case of thyroid dysfunction. Thyroid function tests include a dimension of the thyroid hormones T3 and T4, as well as the TSH (Ali et al., 2017). Historically, styles for classifying cases with milder degrees of thyroid dysfunction have experienced dramatic changes. Classification has involved clinical, biochemical, and immunologic criteria (O'Reilly, 2000). This study was designed to investigate the prevalence of thyroid disorders and its association with sex and age in a population from the city of Derna in eastern Libya.

MATERIALS AND METHODS

The research aimed to determine the prevalence and assessment of thyroid function in individuals of all ages and both genders from various sources in Derna, eastern Libya. Data were collected using a retrospective cross-sectional study, in which we examined 5191 suspected cases of thyroid disease within two years from January 1, 2021, to December 31, 2022, and retrieved data about thyroid function test (TFT) including serum concentrations of TSH, Triiodothyronine (T3), Thyroxine (T4), from computers of nine clinical laboratories in the city of Derna, which included: Bin Sina Lab, Aldeka Lab, Derna lab for medical analyzes, Derna Medical Center, Alzuhur Lab, Tabebk Lab, Al bara Lab, Bin Rushd Lab and Madina Medical Lab. Hence, different types of thyroid imbalances have been categorized.

Statistical Analysis

The prevalence of thyroid dysfunction was determined in terms of number and percentage. Comparisons of the prevalence of thyroid abnormalities in subjects of different age groups and genders were determined in cross tabulation.

RESULTS AND DISCUSSION

A total of 4525 cases regarding age were collected out of 5191, with 666 cases having an unknown age. The age range of the participants spanned from under 10 years to 95 years. Among the 4525 subjects, the group that predominantly reported symptoms of thyroid disease comprised females, making up 82.59% (n = 3737) of the total. In contrast, males represented only 17.41% (n = 788) of the overall cases. Regarding age distribution, most participants fell within the age brackets of 41-50, 31-40, and 21-30, with the highest percentages being 25.28%, 21.48%, and 15.20%, respectively.

Table: (1). Distribution of age groups.

Age	Female cases (n/%)	Male cases (n/%)
≤ 10	70 (1.55)	54 (1.19)
11-20	263 (5.81)	62 (1.37)
21-30	595 (13.15)	93 (2.05)
31-40	822 (18.17)	150 (3.31)
41-50	991 (21.90)	153 (3.38)
51-60	522 (11.54)	115 (2.54)
> 60	474 (10.47)	161 (3.56)

Thyroid dysfunction was observed in 1,082 of the 5,191 subjects, with an overall prevalence of 20.84% for both hypothyroidism and hyperthyroidism. while 4,109 with prevelance 79.16% were euthyroid which had normal TSH, T3, and T4 levels (Figure 1).

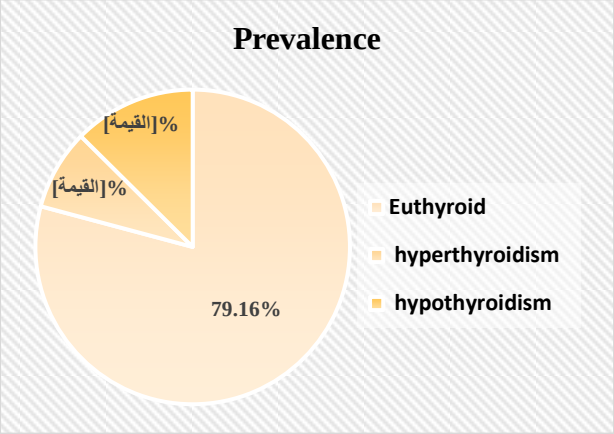

Figure: (1). The percentage of participants exhibiting thyroid dysfunction

Table 2 illustrates the occurrence of thyroid disorders by gender. When analyzing the incidence of different types of thyroid diseases between men and women, it was found that subclinical hypothyroidism affected 9.34% (n=485) of females compared to 1.87% (n=97) of males.

For overt hypothyroidism, the prevalence among females was 1.18% (n=61), while in males it was just 0.19% (n=10). In terms of subclinical hyperthyroidism, females had a prevalence of 4.95% (n=257) compared to 0.98% (n=51) in males. Regarding overt hyperthyroidism, the most significantly impacted group was again females, at 2.06% (n=107), while males had a prevalence of 0.27% (n=14).

Table: (2). Gender-specific thyroid dysfunction prevalence (n & %).

Thyroid dysfunction	Total N (%) 5191 (100%)	Female N (%) 4298 (82.80%)	Male N (%) 893 (17.20%)
Normal (Euthyroid)	4109 (79.16%)	3388 (65.27%)	721 (13.89%)
Subclinical hypothyroidism	582 (11.21%)	485 (9.34%)	97 (1.87%)
Overt hypothyroidism	71 (1.37%)	61 (1.18%)	10 (0.19%)
Subclinical hyperthyroidism	308 (5.93%)	257 (4.95%)	51 (0.98%)
Overt hyperthyroidism	121 (2.33%)	107 (2.06%)	14 (0.27%)

Our results were aimed to see the impact of age group for each gender on the thyroid dysfunction as shown in (Figures 2,3). The study subjects were divided into seven different age groups.

The current results showed that female predominate the study and most of them were in the age group of >30 years old. About 3.07% and 1.97% in age group (41-50) and (51-60) respectively of these cases were suffering from hypothyroidism, while about 2.10% and 1.77% in the age group (41-50) and (31-40) respectively were suffering from hyperthyroidism (figure 2).

The figure 3 showed most of male in this study were in the age group of (> 60) ,(41-50),(31-40) years old respectively. About 0.44% and 0.38% in age group (51-60) and (> 60) respectively of these cases were suffering from hypothyroidism, while about 0.44% and

0.42% in the age group (>60) and (31-40) respectively were suffering from hyperthyroidism.

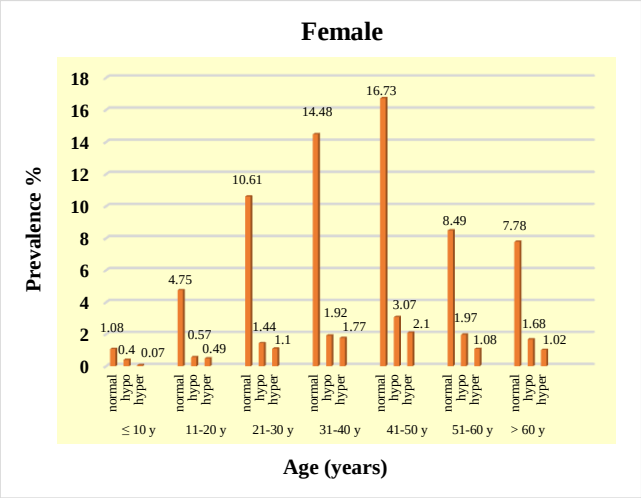

Figure: (2). Prevalence (%) of thyroid dysfunction in different age groups for female.

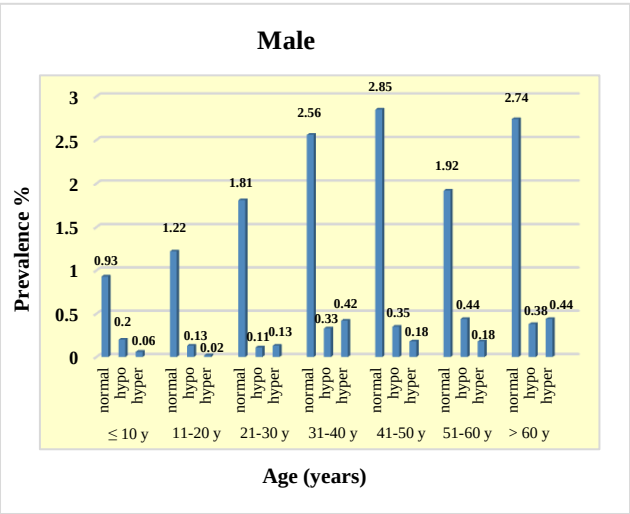

Figure: (3). Prevalence (%) of thyroid dysfunction in different age groups for male.

As far as we know, this research offers the first detailed evidence regarding the prevalence of thyroid disorders in both males and females within the Derna Libyan population for the years 2021-2022. There are several observations derived from this research. Firstly, a larger proportion of women underwent screening for thyroid function tests (TFT) (82.80%, n = 4298) compared to men (17.20%, n = 893) among the total cases, and the majority of those screened were in the 41-50 and 31-40 age brackets, respectively. This observation indicates variations in prevalence rates based on gender and age, which aligns with findings from previous research (Mohammed and Asmeil, 2021). Research has shown that the occurrence of thyroid disease rises with age, and it is estimated that 26% of women who are either premenopausal or menopausal receive a diagnosis of this condition (Wartofsky et al., 2006).

In this investigation, hypothyroidism was present in 12.58% of subjects with thyroid dysfunction overall (11.21% subclinical, 1.37% overt). Likewise, 8.26% had hyperthyroidism (5.93% preclinical, 2.33% overt). Women with subclinical hypothyroidism had a greater incidence rate (9.34%) than those with overt hypothyroidism (1.18%). (Table 2), The findings of this study are in line with a recent study conducted in India that found that the majority of common abnormalities were increased TSH (hypothyroid), accounting for 11% of all cases, with 9.7% of those cases being subclinical (Velayutham et al., 2015). According to recent survey data, thyroxine medication in subclinical hypothyroid individuals has been linked to an elevated risk of coronary events and morbidity rates; this calls for close attention to drug monitoring (Huang and Aw, 2014).

According to Tahir et al. (2020), the estimated annual incidence of hyperthyroidism for women ranges from 0.36 to 0.47 per 1,000

women, while for men it ranges from 0.087 to 0.101 per 1,000 men. This is consistent with our finding that the incidence rate of subclinical and overt hyperthyroid cases was higher in females than in males. Thyroid dysfunction was closely linked to higher rates of dementia, heart failure, arterial fibrillation, and death among the elderly. Cappola et al. (2015) looked at the relationship between these conditions and elderly individuals with high FT4 and low TSH.

Given that thyroid dysfunction can have catastrophic consequences, we suggest that TFT be made a screening test for all women, particularly those who are pregnant and of reproductive age. Infants' delayed brain development at 10 months was substantially correlated with the mother's abnormally low serum-free thyroxine levels at 12 weeks of gestation. When compared to controls born to euthyroid moms, children of women with excessively high TSH levels during pregnancy had significantly poorer IQ scores (Casey et al., 2005). According to Huang and Aw (2014), the Thyroid American Association has suggested that all seniors who are admitted to a sanitarium and women over 50 who are seeking medical attention should have a checkup every five years.

It is essential to comprehend the processes that underlie the fluctuations in TSH and thyroid hormone levels. Although many other factors can affect thyroid function, genetic factors can explain up to 65% of inter-individual variability in TSH and thyroid hormone levels (Panicker et al., 2008). These determinants include age and sex (Song et al., 2019), demographics, intrinsic factors, stress (Helmreich et al., 2005), microbiota (Knezevic et al., 2020), medication use (Cyna et al., 2024), and a variety of environmental factors (Dai et al., 2020).

RECOMMENDATIONS

Early detection and treatment of a thyroid disorder is essential. Also, to identify thyroid dysfunction, additional studies are needed, including an autoimmune, radiological examination and urinary iodometry, which is necessary to assess iodine intake. If they were included, many issues related to thyroid illnesses would be better understood.

CONCLUSION

This study is the first of its kind to evaluate the prevalence of thyroid disorders in Derna City. Thyroid problems are regarded as one of the more recent widespread ailments that impact a wide range of the population and affect more women than men, according to our study, which provides background information on the high prevalence of thyroid diseases in Derna City. Additionally, as people age, thyroid issues become more common. Furthermore, hypothyroidism—particularly subclinical hypothyroidism—was the most common illness type.

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الملخص

تهدف هذه الدراسة إلى تحديد مدى انتشار خلل وظائف الغدة الدرقية وارتباطه بالعمر والجنس لدى سكان مدينة درنة. في هذه الدراسة الاسترجاعية المقطعية، فحصنا 5191 حالة مشتبه بها من أمراض الغدة الدرقية خلال عامين من 1 يناير 2021 إلى 31 ديسمبر 2022، واسترجعنا بيانات اختبار وظائف الغدة الدرقية بما في ذلك تركيزات كل من الهرمون المحفز للغدة الدرقية (TSH)، وثلاثي يودوثيرونين (T3)، والثيروكسين(T4) في المصل، من أجهزة كمبيوتر تسعة مختبرات سريرية في مدينة درنة. حُدد مدى انتشار خلل وظائف الغدة الدرقية من حيث العدد والنسبة المئوية. وُضعت مقارنات بين مدى انتشار اضطرابات الغدة الدرقية لدى أفراد من مختلف الفئات العمرية والأجناس باستخدام جداول متقاطعة. وخلصنا إلى أن أمراض الغدة الدرقية تصيب النساء أكثر من الرجال وتزداد مع التقدم في السن. كما كان قصور الغدة الدرقية النوع الأكثر شيوعًا، وخاصةً دون السريرية.

الكلمات المفتاحية: انتشار اضطرابات الغدة الدرقية، العمر، الجنس، مدينة درنة.