Prevalence of depression among hypothyroid patients being treated with levothyroxine in a tertiary care hospital in Saudi Arabia

Abdullah Almalki1*, Abdulaziz Alosail2, Mohammed Almalki2, Rakan Mal1, Abdulaziz Albacker2, Alwaleed Alrebdī2, Abdulaziz Ismail2, Amir Omair2, Awad Alshahrani2,3,4

ABSTRACT

Background: While the association between depression and hypothyroidism is well established, the prevalence of depression among patients with hypothyroid who are being treated with levothyroxine in Saudi Arabia is still unknown. This study aimed to investigate the latter, as well as to explore the factors associated with depression among these patients.

Methodology: A descriptive cross-sectional study using consecutive sampling was conducted at the National Guard Health Affairs, Riyadh, Saudi Arabia. The Patient Health Questionnaire-9 was used to assess the prevalence and levels of depression among patients with hypothyroidism, who were being treated with levothyroxine. The data were analyzed using Statistical Package for the Social Sciences version 20.0 software.

Results: The study included 130 patients, of whom 89% were female. The prevalence of depression among hypothyroid patients was 70% (95% CI: 62%-78%), 30% had no/mild depression, 27% had moderate depression, and 43% had moderately severe/severe depression. There was a significant association between the prevalence of depression and lower levels of education up to high school (68%), patients older than 30 years of age (85%), and married/widowed patients (83%). Patients with moderately severe/severe depression had more difficulties in performing daily-life activities (91%), as well as higher levels of thyroid-stimulating hormone (TSH) of 2.91 mIU/l (Interquartile range: 1.60-7.05).

Conclusions: There was a significant association between the prevalence of depression and hypothyroid patients who were being treated with levothyroxine, specifically in older patients, those with lower levels of education, and those with high TSH levels.

Keywords: Depression, hypothyroidism, PHQ-9, Saudi Arabia.

Key Message: Screening for depressive symptoms should be taken into consideration while evaluating patients with hypothyroidism.

Introduction

The thyroid gland is one of the most prominent endocrine glands in the human body. It produces thyroid hormones, T3 and T4, which play vital role in body function. Thyroid hormones affect, among others, body temperature and controls basal metabolic rate [1]. Hypothyroidism is a common disorder characterized by low levels of thyroid hormones in the body. With impaired thyroid hormone secretion, patients may suffer from various symptoms, such as depression, fatigue, constipation, weight gain, and sleep problems [2]. Due to low T3 and T4 levels in patients with hypothyroidism, negative feedback mechanisms are not activated [3]. Consequently, the body tries to compensate for the lack of thyroid hormones by stimulating the secretion of the thyroid-stimulating hormone (TSH). In association with depression, thyroid hormones play a
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Abdullah International Medical Research Centre and the institutional review board. This study included patients with hypothyroidism aged between 15 and 80 years and who were being treated with levothyroxine. Any hypothyroid patient who used antidepressants was excluded from the study. Since the PHQ-9 was administered in Arabic, non-Arabic speakers were also excluded from the study.

All patients were briefed about the purpose of the study and were assured about the privacy and confidentiality of their information. Each patient completed an informed consent form and a self-administered questionnaire for their participation. The questionnaire was divided into two sections. The first section was designed to collect demographic data, including sex, age, education, marital status, and employment. The second section contained the PHQ-9 questions, which were used to assess depression levels. The PHQ-9 consisted of nine questions regarding the main indicators of depression, such as lack of interest, lack of energy, feeling sleepy and hopeless, loss of appetite, and any suicidal thoughts. These nine questions are scored on the following scale from 0 to 3, with 0 = not at all, 1 = several days, 2 = more than half the days, and 3 = nearly every day [14]. The PHQ-9 results were categorized as follows: 0-4 no depression, 5-9 mild depression, 10-14 moderate depression, 15-19 moderately severe depression, and 20-27 severe depression. These categories were further divided into no/mild depression, moderate depression, and moderately severe/severe depression groups.

The data were analyzed using Statistical Package for the Social Sciences version 20.0 software. Descriptive statistics were used to report absolute frequencies and percentages. Categorical variables were analyzed using Pearson’s chi-squared test. A p-value equal to or less than 0.05 was considered as statistically significant. Prevalence was calculated as the number of patients who displayed symptoms of depression divided by the total population.

Results

A total of 160 questionnaires were distributed. Thirteen patients (8%) refused to participate, seven (4%) were excluded from the study since they had pre-existing depression according to their medical records, and 10 (6%) incomplete questionnaires were rejected. The final response rate was 130 (82%). There were 116 females (89%) and 113 (87%) were married or widowed. Seventy-seven (59%) were aged between 30 and 49 years, and 33 (25%) were aged 50 years or older. Fifty-six (42%) patients were uneducated or educated up to intermediate school, while 77 (59%) were high school educated or above. Thirty percent of the patients were employed at the time of the study, whereas 70% were not (See Table 1 for further details). The prevalence of moderate to severe depression among hypothyroid patients who were being treated with levothyroxine was 70% (95% CI: 62-78).

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The number and percentage of patients responding to questions with various durations/severity of depression are given in Table 2. There was a significant association between prevalence of depression with lower levels of education ($p = 0.02$), old age ($p = 0.04$), and with married/widowed patients ($p = 0.01$). Patients with a bachelor’s degree and above (32%) had lower levels of moderately/severe/severe depression compared to patients with lower levels of education up to high school (68%). Patients younger than 30 years (15%) had lower levels of depression in comparison to patients older than 30 years (85%). No other significant relationship was found with other variables, such as gender and employment status. (See Table 2 for further details.)

There was a significant association between depression and difficulties facing daily-life activities among hypothyroid patients ($p = 0.001$). The percentage of patients having difficulties in daily-life activities is shown in Figure 1. Out of 57 patients with moderately/severe/severe depression, 52 (91%) faced difficulties in performing daily-life activities. A Kruskall-Wallis test revealed that there was a significant association between depression category and TSH levels ($p = 0.03$), as shown in Figure 2. Patients with no/mild depression had a median TSH level of 1.74 mIU/l (IQR: 0.51-3.69) as compared to 2.68 mIU/l (IQR: 1.25-6.41) in the moderate depression group, and 2.91 mIU/l (IQR: 1.60-7.05) in the moderately severe/severe depression group.

### Discussion

In this study, the prevalence of depression among patients with hypothyroidism who were being treated with levothyroxine was 70%. This prevalence is considered high when compared to the worldwide prevalence; for example, the prevalence was estimated to be 12.5% in...
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Figure 1. How difficult is it to perform daily activities.

Figure 2. Depression severity scale.
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India [7] during 2016, and 5% in the United States during 2018 [15]. Moreover, in a study conducted in a primary healthcare facility and on a population with a similar cultural background, Mohammad et al. [16] estimated the prevalence to be 33.9% among hypothyroid patients. However, the high prevalence found in this study could be attributed to the sample size, as the latter study only included 56 patients. In addition, this study was conducted in a military hospital and it is suggested that those patients are either military personnel or a member of a military family, which could have contributed to the high prevalence of depression, despite being treated with levothyroxine.

The majority of the patients in our study were female (89%). It is suggested that the prevalence of hypothyroidism is more common in females than males, which is in line with the results of the studies conducted by Unnikrishnan et al. [17], Bathla et al. [9], and Mohammad et al. [16].

The age range of the sample was between 15 and 80 years. Most of the patients were in the age group of 30-50 years. Patients aged over 30 years had higher levels of depression compared to patients younger than 30 years. A study conducted by Zavareh et al. [18] in 2016 revealed no significant association between depression and age among hypothyroid patients. This difference could be due to the fact that this study was conducted in one military hospital and military personnel are subjected to physical and psychological stress that could develop into depression with age.

According to our study, patients with bachelor degrees and above had lower levels of depression when compared to those with lower levels of education (up to high school). This is supported by Dudal and Bracke’s [19] study in 2016, which concluded that lower levels of education are associated with an elevated risk of depressive symptoms. A shortcoming of this study was that there may have been a non-response bias since the patients’ average response rate was 61.43% [19]. On the contrary, a study conducted by Bathla et al. [9] showed that patients with a bachelor’s degree and above had higher levels of depression when compared to those with lower education levels. Nevertheless, this study was limited by volunteer bias.

Patients with moderate to moderately severe/severe depression had higher levels of TSH (median>2.6 mIU/l), which is similar to the findings of the studies conducted by Teixeira et al. [20] and Guimarães et al. [21] that revealed a positive association between depression and serum TSH levels. On the contrary, the study by Andrade [22] showed no association between serum TSH levels and the prevalence of depression.

Based on our literature review, there are limited published studies in Saudi Arabia that address the prevalence of depression among hypothyroid patients who are being treated with levothyroxine; therefore, our study contributes to this expanding area of research. However, the results of our study should be interpreted with caution as other possible causes of depression, such as diabetes mellitus and hypertension, were not collected; nonetheless, a high existence of chronic disorders in our population seems unlikely since only 25% were aged 50 years and older. Moreover, the results were limited due to the small sample size, which increased the margin of error. Furthermore, the doses of levothyroxine were not registered in the database, which hindered studying the association between depression and therapeutic levothyroxine doses. The study also took place in one institution only.

Seventy percent of the patients in this study reported having depressive symptoms, despite being treated with levothyroxine. Age and lower levels of education were associated with depression. The majority of the patients had moderately severe/severe depression. Based on the results, it is recommended that any hypothyroid patient, regardless of being under treatment or not, should be screened for depression.

Acknowledgments
The authors thank Dr. Aida Al-Dughaither, Consultant and Assistant Professor, College of Medicine, King Saud bin Abdulaziz University for Health Sciences, Department of Family Medicine, Ministry of National Guard-Health Affairs, Riyadh, Saudi Arabia, and the nurses in the Family Medicine Department in ISKAN and Khashm Al aan Clinics, Ministry of National Guard - Health Affairs, Riyadh, Saudi Arabia. They are also thankful to the Research Unit, College of Medicine, King Saud bin Abdulaziz University for Health Sciences, Riyadh, Saudi Arabia.

List of Abbreviation
PHQ-9  Patient Health Questionnaire 9

Conflict of interest
The authors declare that there is no conflict of interest regarding the publication of this article.

Funding
None.

Consent for publication
Written informed consent was obtained from the patients.

Ethical approval
Ethical approval was granted by the institutional review board via reference number: IRBC/1411/18, dated: 01/08/2018.

Author details
Abdulrahim Almalki1, Abdulaziz Aloisi2, Mohammed Almalki2, Rakan Mal3, Abdulaziz Albacker2, Alwaleed Alrebi2, Abdulaziz Ismail2, Amir Omar2, Awad Alshahrani2,3,4
1. Faculty of Medical Sciences, University of Groningen, Groningen, The Netherlands
2. College of Medicine, King Saud bin Abdulaziz University for Health Sciences, Riyadh, Saudi Arabia
3. Department of Medicine, Ministry of National Guard-Health Affairs, Riyadh, Saudi Arabia
4. King Abdullah International Medical Research Center, Riyadh, Saudi Arabia
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