Depression Level Among Thyroid Disorder Patients and Its Correlation

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ABSTRACT

Objective: Patients with thyroid disorders were found to experience depression due to several factors. The aims of this study was to measure depression level among thyroid disorder patients and examine the correlation between depression and Thyroid Stimulating Hormone (TSH) and free Thyroxine (fT4), stressful life events and social support level. **Methods:** A cross sectional study was carried out at one of the non-profit hospital at central region of Peninsular Malaysia. 153 thyroid patients were selected by using simple random sampling technique. The ethical approval was sought from IIUM Research Ethics Committee (IREC563) and the Medical Research and Ethics Committee (MREC) (NMRR-15-2127-28667). Several tools were used in this study including Depression Anxiety Stress Scale-42 (DASS-42), list of Life Threatening Experiences (LTE), Multidimensional Scale of Perceived Social Support (MSPSS); and Thyroid Function Test including TSH and fT4 were reviewed from the patient's file. A correlation test was used to analyse the data by using SPSS version 21.0. **Results:** About 15% (n=23) out of 153 thyroid disorder patients had varies degree of depression (males - 7.8% (n=3) and females – 17.3% (n=20)). Also, there were positive correlation between depression and TSH (r=0.235, p=0.03), stressful life events (r=0.264, p=0.001) and negative correlation (r=-0.068, p=0.402) with perceived social support from family. **Conclusion:** These findings suggested that thyroid disorder patients had depression and the factors associated with depression were high TSH level, recent stressful life events and low social support from the family. These factors can be considered while assessing thyroid disorder patients who had symptoms of depression.

Keywords: Thyroid disorders, Depression, Correlation

INTRODUCTION

Patients with thyroid disorder have a high risk to experience depression resulting from the thyroid hormone fluctuations. The prevalence of depression among thyroid disorders was reported worldwide. A community-based study showed that about 10.1% out of 189 elderly had depression with thyroid disorder at Perth, Australia (1). Furthermore, another study showed that about 9.4% (n=47) out of 498 with thyroid disorder had recurrent depression and 8.8% (n=44) of them had single depression episode at Germany (2). In Asian countries, about 15% (n=9) out of the 60 thyroid disorder patients suffered from depression in Nepal (3). Besides 24.3% (n=19) out of 80 thyroid disorder patients has been diagnosed as depression in Turkey (4) . Based on these study findings, depression can found in patient with abnormal thyroid function. It can show that the thyroid disorder patients may have psychiatric disorders such as depression as a co morbid illness. However, there is scarce of data on depression among thyroid disorder patients in Malaysia in spite of many studies on depression has been conducted in Malaysia recently.

The thyroid stimulating hormone (TSH) is a hormone that stimulates production and secretion of free Tri-idothyronine (fT3) and fT4 from the thyroid gland which can led to emotional disturbance due to insufficiency of these hormones (5, 6). However, the association between the thyroid hormone and depression still debatable. Eventhough there were conflicting on association between the thyroid hormone and depression, but some studies showed that there were an association between the imbalance of thyroid hormone and depression (4,9). In conrast, a population-based study found that there were

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no significant association between TSH level and depression by using Beck Depressive Inventory-II (BDI-II) in Germany (2). The contrary could be due to the variety of the tools used to assess the depression and differences on thyroid hormone range. Moreover, most of the studies were population-based, therefore the findings might be biased and possible that the thyroid function test was caused depression('reverse causality'). Thus, this current study was only focusing on the patients with had been diagnosed as thyroid disorders.

Stressful live events such as death of loved ones, discovering new diseases or illnesses, spouse addiction, sleep pattern disturbances and financial problems also have been identified as one of the causes of depression among thyroid disorder patients (7, 8). . As a consequence, it can lead to stress and effect to hypothalamic-pituitary-thyroid (HPT) axis and hypothalamic-pituitary-adrenal (HPA) axis (9). Moreover, during the stress event, the cortisol from the hypothalamus will inhibit TSH secretion and lead to decrease conversion of thyroxine (T4) to triiodothyronine (T3). Thus, the neurogenesis activity in the brain will be reduced and symptoms of depression will be appearing such as change in mood, thinking and activity that impair personal and social functioning (10, 11).

Social support is a form of coping assistance by tangible or emotional form provided by specific people, such as spouses, other family members and communities (12, 13). Tangible support comprises advice or material support, such as monetary assistance, services and goods, while emotional support adds feelings of self-worth and being cared for. (14, 15). Inadequate social support may lead to depression due to a lack of positive attitudes and a reduced social support perceived level, which might decrease self-esteem and cause negative thoughts, interpersonal problems and changing relationships with family members and peers (15-17). A study on thyroid cancer survivors reported that they still needed emotional support and health information from healthcare providers, even though they had good prognoses compared to other groups of cancer survivors (18). Thus, social support needs to be considered as one of the factors associated with depression.

However, the findings of these studies were unclear and scattered due to selection of varies sample and different measurement of the tools. Hence, the aims of this study is to measure depression among thyroid disorder patients and find the correlation between depression and TSH, fT4, stressful life events and social support.

METHODOGY

This is a cross-sectional study design as this method is very practical because the study period is short and the data is collected through a survey. One hundred and fifty three thyroid patients were recruited from the Medical Outpatient Department (MOPD) in one of the non-profit hospitals in Central region of Peninsular Malaysia using simple random sampling. A permission to conduct a study was obtained from the IIUM Research Ethics Committee (IREC563) and he Medical Research and Ethics Committee (MREC) (NMRR-15-2127-28667). A data collection was started from 1st March 2016 to 31st May 2016. A patient who fullfill the inclusion and exclusion criteria were approached to participate in this study. The inclusion criteria for this study were Malaysian citizen and aged 18 and above , have been diagnosed as thyroid disorders, literate and can understand Malay or English language, while the patient who had dementia and psychotic disorders will be excluded in this study.

Research Instruments

Several tools were used as research insruments in this study which include socio-demoraphic data, Depression Anxiety Stress Scale-42 (DASS-42), The list of Life Threatening Experience (LTE), Multidimensional Scale of Perceived Social Support (MSPSS) and thyroid function tests.

Socio-demographic data was obtained by using the semi-structured questionnaire including the demographic data section such as age, gender, financial status, ethnic and family of psychiatric illness. Meanwhile, in medical history section will consist of type of thyroid disorders, duration of the thyroid disorders, co-morbidity of any other illness and type of current medication used.

Depression Anxiety Stress Scale-42 (DASS-42). This tool has been developed by Professor Dr. Peter Lovinbond from the University of New South Wales Australia (19) which consist of stress, anxiety and depression domain. However, only depression domain was used to determine the level of depression. There are consist of 14 statements where the patient need to indicates how much the statements applied to him/her over the past week in a likert scale from 0 to 3 (0=did not apply to me at all; 3-applied to me very much). Then, the score was summed up and classified as followed; 0 – 9 (normal); 10 - 13 (mild); 14 – 20 (moderate); 21-27 (severe) and 28 and above (extremely severe) (19). Moreover, the psychometric properties of DASS-42 has been tested in various clinical populations (20-23) and

non-clinical populations (24-26), showing excellent internal consistency at range 0.87 to 0.97. Moreover, construct validity found good factor loading of 0.4 to 0.88 (20, 23, 27, 28) and the convergent and discriminant validity showed satisfactory (27, 29) . Besides, this tool was translated into Malay by Ramli et al. (2012), with an excellent Cronbach's alpha value of 0.94 and a construct validity test found good factor loading of 0.4 or higher for depression (30). This tool was prepared in English and Malay language (30). The DASS-42 is free, and the items can be downloaded from the DASS-42 website (http://www2.psy.unsw.edu.au/Groups/Dass/down.htm) and copied without restriction. For the Malay version of the DASS-42, the researcher obtained permission from the authors (31) for its use in this study.

The list of Life Threatening Experience (LTE) has been developed to assess the impact of stressful life events (32). The LTE has 12-items which consist of common life events that tend to be threatening over the past six months. A binary scoring is used which score 1 indicates if the life events has happened and score 0 if the event has not happened. Then, the number of events that had happened will be counted. It is score on the basis that the more life events a patient had been through, the higher the score, therefore the greater of impact on the patient (33). Psychometric tests of this tool have been conducted and found the test-retest reliability was good to excellent (Kappa = 0.61-0.87). In addition, the intra-class correlation (ICC) coefficient was 0.86% suggested that the item stability over time is satisfactory (34) . Besides, the construct validity showed a positive association with psychological distress and mental health problems, concluding that the LTE is valid in measuring recent life stress and depression (35). The LTE has been translated into Malay, and it was found that the parallel and test-retest reliability scores were satisfactory (Kappa = 0.67–0.88) (36). English and Malay language were used for this tool and the patient may select based on the language preference.

Multidimensional Scale of Perceived Social Support (MSPSS) was to identify the level of social support among patients who suffered from thyroid disorders (37). MSPSS is a self report measure in a likert scale (from very strongly disagree to very strongly agree) which contains 12 items to assess the adequacy of social support from three different sources; Family, Friends and Significant Others. The scoring is based on the mean scale score and has been categorized as follows; 1.0 to 2.9 (low support), 3.0 to 5.0 (moderate support) and 5.1 to 7.0 (high support) (37). This tool also was available in English and Malay language. In addition, the reliability, validity and factor structures have been tested in several clinical and non-clinical populations and found (38-40) excellent internal consistency and excellent predictive validity (r = 0.5–0.7). Furthermore, the confirmatory factor analysis (CFA) showed a good comparative fit index (CFI) (Vaingankar et al., 2012; 41). This tool has been translated into Malay and found good internal consistency (0.89) and parallel form reliability (0.94) with the Malay version of the General Health Questionnaire that confirms the stability and consistency of the MSPSS (36).

Thyroid function test such as Thyroid Stimulating Hormone (TSH) and free Thyroxine (fT4) were reviewed from the patient's file. The reference ranges for TSH and fT4 as following; TSH: 0.4 – 4.5 miliunits per litre (mU/L) and fT4: 9.0 – 25.0 picomoles per litre (pmol/L) (42). However, the reference range also is based on the laboratory where the blood sample will be analysed. The test results will be following; hypothyroid (high TSH and low Ft4), hyperthyroid (low TSH and high Ft4) and a low TSH level together with low fT4 level can indicate a disorder of the secondary thyroid disorders such as pituitary disorder (42).

Statistical analysis

The data analysis was conducted using the IBM Statistical Package for the Social Sciences (SPSS) version 21.0 which copyrighted by International Business Machines Corporation (IBM Corp.) in 2013. The analysis result were organized in the form of table. A p-value of <0.05 was considered statistically significant. Finally, the correlation test was used to explore any association between depression and TSH, fT4, stressful life events and social support level.

RESULTS

The characteristics of study sample

Table 1 showed the characteristics of study sample. Out of 153 participants, majority of them were female (75.2%) and 24.8% were male. The minimum participants' age was 18 years old and the maximum age was 77 years old. The mean of the age was 40.16±13.54 years old. Most of them were Malay (60.1%), followed by Chinese (32.7%) and only 7.2% was Indian. More than half participants were married (69.9%), 20.3% were widower/widow, 7.2% were single and only 2.6% were divorced. Majority of them still working in governement and private sector (65.4%) suggested

Table 1: The Characteristics of Study Sample (n = 153)

Variables		Frequency	Percentage (%)	Mean (SD)
Gender	Male	38	24.8	
	Female	115	75.2	
Age (years)	18-25	20	13.1	40.16 (13.54)
	26-40	68	44.4	
	41-60	51	33.3	
	Above 60	14	9.2	
Race	Malay	92	60.1	
	Chinese	50	32.7	
	Indian	11	7.2	
Marital status	Married	107	69.9	
	Widow/er	31	20.3	
	Single	11	7.2	
	Divorced	4	2.6	
Occupation	Employed	100	65.4	
	Unemployed	53	34.6	
Income	Less than MYR1000	58	37.9	
	More than MYR1000	95	62.1	
Classification of thyroid disorders	Hyperthyroid	129	84.3	
	Hypothyroid	11	7.2	
	Thyroid Cancer	13	8.5	

Table 2: Classification of Depression among Thyroid Disorder Patients

Classification	Hyperthyroid (%)	Hypothyroid (%)	Thyroid cancer (%)	Total (%)
Normal	110 (85.3)	8 (72.7)	12 (92.3)	130 (85)
Mild	6 (14.7)	0 (0)	1 (7.7)	7 (4.6)
Moderate	9 (7.0)	1(9.1)	0 (0)	10 (6.5)
Severe	3 (2.3)	1(9.1)	0 (0)	4 (2.6)
Extremely severe	1 (0.8)	0 (0)	0 (0)	2 (1.3)

Table 3: Correlation between the depression and thyroid function tests, stressful life events and social support lev (n=153)

Variables	r	p value
Thyroid Stimulating Hormone level	**0.235****	**0.003**
Free thyroxine level (Ft4)	0.057	0.483
Stressful life events	**0.264****	**0.001**
Social support from Significant	-0.133	0.102
Social support from Family	**-0.159***	**0.050**
Social support from Friends	-0.068	0.402

*Correlation is significant at the 0.05 level (2-tailed)

**Correlation is significant at the 0.01 level (2-tailed)

was unemployed. Most of the participants had income more than MYR1000 (62.1%) and 37.9% had income less than MYR1000. Most of the respondents completed their secondary school (52.3%). For the classification of thyroid disorders, 84.5% were diagnosed as hyperthyroid, followed by 7.2% hyperthyroid and 8.5% had thyroid cancer.

Depression among thyroid disorder patients

15% (*n*=23) out of 153 thyroid disorder patients had varies degree of depression. Table 2 showed the classification of depression among thyroid disorder patients grading by DASS-42. However, 24.8% (*n*=19) out of 129 hyperthyroid patients had mild to extremely severe depression (mild, *n*=6; moderate, *n*=9, severe, *n*=3 and extremely severe, *n*=1). Meanwhile 18.2% (*n*=2) out of 10 hypothyroid patients had moderate to severe depression (moderate, *n*=1; severe, *n*=1) and 7.7% (*n*=1) out of 13 who had thyroid cancer reported mild depression only.

Correlation between depression and TSH, fT4, stressful life events and social support

Table 3 summarized the correlation between depression grading by DASS-42 and thyroid TSH, fT4, stressful life events and social support computed by a Pearson product-moment correlation coefficient. The findings of the study indicated that there is weak positive correlation between depression TSH level (*r*=0.235, *p*=0.003) and stressful life events (*r*=0.264, *p*=0.001). Also, depression showed the negative correlation with social support from family (*r*=-0.159, *p*=0.003). However, there were no correlation between depression and fT4 level (*r*=0.057, *p*=0.483), social support from Significant Others (*r* = -0.133, *p* = 0.102) and family (*r*=-0.068, *p*=0.402).

DISCUSSION

In this study, there were shown that, the most of participants were female (75.2%) at ranged of age 26 to 52 years old. Majority of them were been diagnosed as hyperthyroid (84.3%). The similar findings were found at one of the semi-profit hospital in Malaysia (43). Both of the studies were conducted at the same region of Malaysia and known as referral centre for thyroid management (44). Thus, this suggested that the most common patients who seek treatment for thyroid were middle-aged females with hyperthyroid. Besides, this in line with another study at Asian countries, where majority of the patients were female and at the middle aged of groups (3, 45). However, most of them been diagnosed as hypothyroid. These findings were contrast in Europe where found that the thyroid nodules were dominated among middle to older age of groups (2, 46). The varies of thyroid disorders found at different countries might be caused by geographical differences which could contribute to cause of thyroid disorders.

The aim of this study was to measure prevalence of depression among thyroid disorder patients, and the finding revealed that only 15% (*n*=23) out of 153 patients experienced depression.When classified to group of thyroid disorders, hyperthyroid patients were most suffered from depression from mild to extremely severe depression rather than hypothyroid patients who had moderate to severe depression and one patient had mild depression from the thyroid cancer group. However, there was not statistical significant between the level of depression and group of thyroid disorders (*p*=0.283). This finding was supported by the results of a cohort study showed that about 69% (*n*=44) out of 64 untreated hyperthyroid had depression and 46% (*n*=29) from this group had persisted depression even after the treatment (7). This is in contrast to the findings reported from the three descriptives studies which found that the high prevalence of depression was among hypothyroid patients (45, 47, 48). Furthermore, the significant correlation between depression and type of thyroid disorders found (*p*=0.01) (46). This discrepancy may be due to various tools were used to score depression symptoms, thus the grading of depression were varies. On the other hand, most of the studies were not include all types of thyroid disorders, therefore, the presented of depression were focused on the group studied only and cannot generalized to other type of thyroid disorders.

Also, this present study revealed that there was positive significant correlation between depression and TSH level. It means the higher of the TSH level, the stronger to had depression. This evidence was supported by population-based at Bulgaria that showed the significant association between the TSH level and depression was among participants who had high level of TSH (*p*=0.026) (48). However, some studies were failed to showed the association between these two variables (1, 2, 49). A cross sectional study on 235 patients at four out-patients clinics in United Kingdom found that there was no association between the TSH and GHQ score (*p*=0.79) (49). In addition, the similar finding was found in two population-based studies which showed that there was no association between the two variables eventhough these studies were exclude all the patients who had history of thyroid

disorders or on treatment (1, 2). Based on these findings, we can assume that the TSH was likely to be associated with depression presentation among thyroid disorders patients. However, a large sample size is recommended in order to generalize the findings to the other settings.

In addition, this study proved that there was inverse correlation between depression and social support from family. This finding suggested that the depression were likely reduced when the patients received high support from their family. The similar finding was found to determine the social support level among 143 thyroid patients who underwent for thyroid surgery until their post surgery follow-up. The results indicated that the family members were given high emotional support within the follow-up period (p<0.05) (50). This present study also showed the thyroid patients received high support from their friends, however, there was no statistically significant (p=0.402). Unlike the survey study on 619 married women who suffered from autoimmune thyroid disorders revealed the statistically significant on mean difference score for emotional support by their husband (p<0.05) (13). However, the participants in this study were recruited from the social networking group website, thus for those who had good social support were more likely to participate in this study. Therefore, their perception on social support was more positive and realistic.

Also, in our study found that the stressful life events had positive correlation with depression (p=0.001). It showed that the stressful life events had influence depression presentation. The similar result was reported in their cohort study that found most of the hyperthyroid patients had increase on stressful events before the onset of depression (7). Moreover, 62.8% of 301 patients and had history of depression reported at least one moderate to severe stressful life events in a six months period prior to depression onset (51). These studies were supported which mentioned most of patients who had depression may experience more stressful life events on six months prior to depression symptoms onset (5). Therefore, these findings proved that the recent stressful life event may contribute to depression symptoms presentation.

CONCLUSION

The study findings reveal that a small percentage of the thyroid disorder patients experienced depression from mild to extremely severe depression. This group of patients are considered vulnerable to psychiatric illness if the symptoms of depression are left untreated. Therefore, awareness of this issue should be increased, particularly among healthcare providers and family members of patients, to prevent negative long-term outcomes such as patients' loss of functional ability and suicidal ideation, which can eventually develop into clinical depression. On the other hand, depression among thyroid disorder patients might be associated who had high TSH level, experience recent stressful life events and received low support from the family members. Hence, longitudinal study is needed to confirm this result due to several limitations are found in this study. First, the result cannot be generalized due to the study conducted at one hospital only. Second, depression is the multifactor disorders and should be controlling by several factors such as family and social history, hereditary and morbidity. Therefore, the inclusion and exclusion criteria of participants need to be considered to prevent confounder. Moreover, the DASS-42 is self-reported and maybe the result more optimistic than reality. Thus, the information bias might be occurred. Lastly, due to the nature of cross-sectional study design, the sample size is relatively small and as consequences, the statistical power of the study decreases. Therefore, a large scale of sample is needed to confirm the study findings.

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CONFLICT OF INTEREST

There is no conflict of interest to report.

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