

# Studying Depression Status and Possible Association with Vitamin D Deficiency and the Level of Thyroid Stimulating Hormone among Jordanian Patients with Addiction

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## ABSTRACT

**Objectives:** The main objectives of the present study were to evaluate both the levels vitamin D and thyroid stimulating hormone among addicted patients.

**Method:** Case control study design was conducted in the Governmental Center for Treatment and Rehabilitation of Addiction. Study sample included 36 patients with addiction and 21 control subjects. A questionnaire was constructed for data collection, which included three parts, the first part included demographical data such as age, sex, marital status, monthly income,...etc., while the second part was about addiction state and the related factors of significance. The third part was the assessment of depression (diagnosis of depression was made clinically by specialist in the center) that was measured using Aaron Beck scale for depression, a self-report mood questionnaire.

**Results:** The data of the present study showed the presence of depression significantly in patients with addiction compared with control subjects. No significant relationship was observed between the level of vitamin D and depression in patients with addiction ( $p=0.550$ ). The level of TSH was significantly lower in patients compared with control patients.

**Conclusion:** Patients with addiction had high level of depression, and low levels of TSH and vitamin D.

**Keywords:** Addiction, Beck Aaron Scale, Depression, TSH, Vitamin D

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## Introduction

Depression may be defined as a state in which there is a low mood and aversion to activity, which is expected to interfere with various personal aspects including thoughts, behaviors, feelings and sense of well-being.<sup>(1,2)</sup> Depression also interferes with the working ability and the utilization of health care services.<sup>(3)</sup>

The incidence of major depressive disorder has been estimated to be 6.6%, while the prevalence of depression has been estimated as 6.2%.<sup>(4)</sup> It has been estimated that at global level there are 322 million persons suffering from depression.<sup>(3)</sup>

Globally, there were 804,000 cases of suicide commitment in 2012, which gave the impact of depression to be a main cause of death among adults.<sup>(5)</sup>

Addiction can be defined as a chronic disease affecting brain reward, motivation, and memory. Alterations in these circuits may result in biological, psychological, social and spiritual manifestations. Such individuals try to compensate for reward and/or relief through substance use.<sup>(20)</sup>

Vidgren et al<sup>(6)</sup> conducted a study to examine the relationship between the level of vitamin D and depression among population. The results indicated that about 11% of study participants had depression. The mean age of study participants was  $62.6\pm 6.4$  years. The level of vitamin D was  $43.8\pm 17.7$  nmol/L. About 65% of participants had vitamin D  $<50$  nmol/L, while 5.0% had the concentrations  $\geq 75$  nmol/L. Taken together, the lower concentration of vitamin D is associated with depression among elderly population.

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Nguyen et al<sup>(7)</sup> conducted a study to investigate the association between vitamin deficiency and depressive symptoms among elderly Japanese individuals. Several vitamins were analyzed including vitamin D. The results indicated that about 27% of participants had depressive symptoms. The main results of this study did not show a significant correlation between vitamin intake and depressive symptoms in male or underweight participants. On the other hand, associations between vitamin deficiencies and depressive symptoms were observed among female and overweight elderly participants. No other age groups have been described in the abstract of this study.

Other studies reported a correlation between depression and low vitamin D levels among elderly persons.<sup>(8,9)</sup> The study of Kim et al<sup>(10)</sup> evaluated the relationship between thyroid-stimulating hormone (TSH) level and depression. Study findings showed increased risk of depression among females who had the highest levels of TSH ( $p < 0.001$ ). Taken together, alterations in thyroid function elevate the possibility of occurrence of depression and are considered modifiable risk factors for female depression. In these studies, hypothyroidism cases were not described.

Forman-Hoffman and Philibert<sup>(11)</sup> found an association between lower TSH and higher T4 levels with existing depressive syndrome in men, while women exhibited only higher T4 levels to be correlated with current depressive syndrome.

Mackawy et al<sup>(12)</sup> conducted a study to examine the relationship between hypothyroidism and vitamin D deficiency. Study findings showed that the serum level of vitamin D was significantly lower in hypothyroid patients compared with controls ( $p = 0.000$ ). It has been interestingly reported that vitamin D and thyroid hormone interact with similar receptors known as steroid hormone receptors.<sup>(12)</sup> A gene in the Vitamin D receptor participates in exposing people to autoimmune thyroid disease including Graves' disease and Hashimoto's thyroiditis.<sup>(12)</sup>

**Study objectives:** The main objectives of this study are: to evaluate the level of depression among addicted patients, to evaluate the level of vitamin D of addicted patients, and to evaluate the level of thyroid stimulating hormone of addicted patients. It is also to assess the impact of demographic variables on addiction status.

## Methods

A case control study design was conducted to compare two groups of participants, control group and addiction group. The study was conducted in the Governmental Center for Treatment and Rehabilitation of Addiction. The study included 36 patients who visited the center for treatment of addiction. Control sample included 21 persons working at medical laboratories and nurses.

**Construction of a questionnaire for data collection:** The questionnaire included three parts; the first part included demographical data such as age, marital status, monthly income, educational level, and place of residency, while the second part was about addiction state and the related factors of significance. The third part was about measuring depression through using Beck Aaron scale for depression, a self-report mood questionnaire. This instrument included 21 items so that at the end of depression scale, a score for each participant to determine depression level which was scored as: No depression (0-9), Simple depression (10-15), Medium depression (16-23), and Severe depression (24-36) Clinical assessment of patients was made by psychologists in the center.

**Biochemical assay of vitamin D and TSH:** clinical laboratories were used to determine the levels of vitamin D and TSH.

The study was conducted over six months from 1/1/2014-1/7/2014

Any type of addiction was considered.

**Statistical analysis:** data were analyzed using SPSS version 20. Data were represented as frequencies, percentages and significance. Relationships between variables were determined depending on Chi-Square and T Test. Significant relations were considered at alpha level  $< 0.05$ .

## Results

As demonstrated in (Figure 1), the study included 36 addicted patients and 21 control subjects.

As seen in (Table I), all demographic characteristics included did not predict any cause of addiction ( $p > 0.05$ ).

All patients with addiction were smokers, while two patients out of 21 control subjects were smokers (Figure 2). Smoking seems to be a deriving factor for addiction as seen in (Table II). There was a significant relationship between depression level between patients with addiction and control subjects ( $p = 0.042$ ).

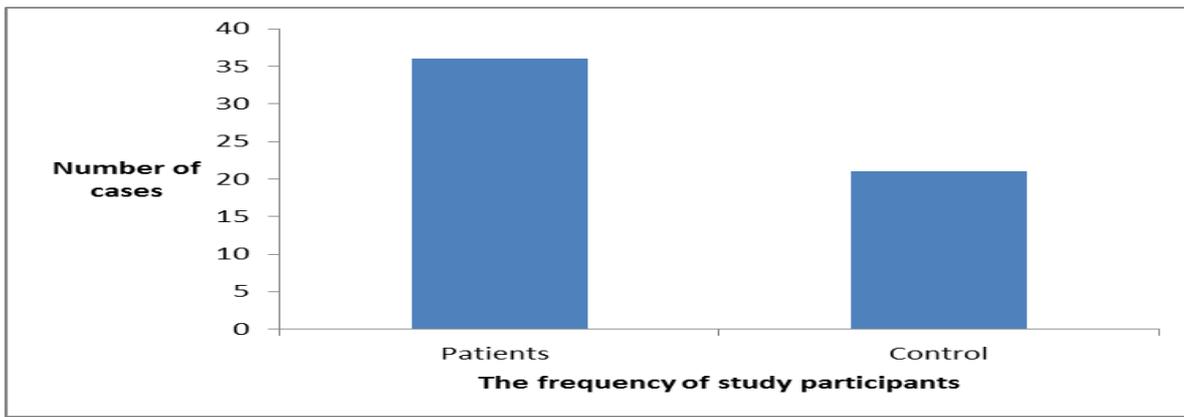


Fig 1: The frequency and distribution of study participants

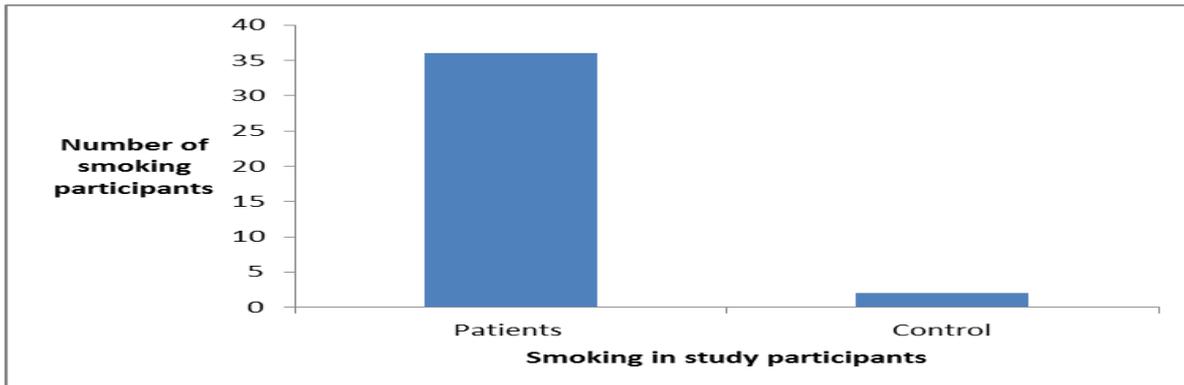


Fig 2: The frequency and distribution of smoking in study participants

Table I: Demographic characteristics of study participants

| Variable             | Patients |       | Control subjects |        | P value |
|----------------------|----------|-------|------------------|--------|---------|
|                      | N        | %     | N                | %      |         |
| Age:                 |          |       |                  |        | 0.673   |
| - <18                | 1        | 2.8%  | 1                | 4.8%   |         |
| - 18-24              | 21       | 58.3% | 10               | 47.6%  |         |
| - 25-30              | 9        | 25%   | 3                | 14.3%  |         |
| - 31-36              | 2        | 5.6%  | 3                | 14.3%  |         |
| - >36                | 3        | 8.3%  | 4                | 19%    |         |
| Educational level:   |          |       |                  |        | 0.635   |
| - Secondary or less  | 26       | 72.2% | 4                | 19%    |         |
| - Diploma            | 4        | 11.1% | 0                | 0%     |         |
| - Bachelor           | 6        | 16.7% | 13               | 62%    |         |
| - Graduated studies  | 0        | 0     | 4                | 19%    |         |
| Social status:       |          |       |                  |        | 0.439   |
| - Married            | 5        | 13.9% | 10               | 47.62% |         |
| - Single             | 30       | 83.3% | 11               | 52.38  |         |
| - Others             | 1        | 2.8%  | 0                | 0      |         |
| Monthly income (JD): |          |       |                  |        | 0.238   |
| - <400               |          |       |                  |        |         |
| - 400-800            | 30       | 83.4% | 10               | 47.62% |         |
| - >800               | 3        | 8.3%  | 5                | 23.81% |         |
|                      | 3        | 8.3%  | 6                | 28.57% |         |
| Place of residency:  |          |       |                  |        | 0.724   |
| - Village            | 3        | 8.3%  | 5                | 23.8%  |         |
| - City               | 27       | 75%   | 16               | 76.2%  |         |
| - Badia              | 1        | 2.8%  | 0                | 0      |         |
| - Campus             | 5        | 13.9% | 0                | 0      |         |

**Table II:** Degree of depression in study participants

| Degree of depression | Patients |       | Control subjects |       | P value |
|----------------------|----------|-------|------------------|-------|---------|
|                      | N        | %     | N                | %     |         |
| No                   | 8        | 22.2% | 13               | 61.9% | 0.042   |
| Simple               | 2        | 5.6%  | 4                | 19%   |         |
| Medium               | 8        | 22.2% | 2                | 9.5%  |         |
| Severe               | 18       | 50%   | 2                | 9.5%  |         |

We evaluated the impacts of addiction on depression and other biological variables including vitamin D, and thyroid stimulating hormone (TSH). As shown in (Table III), patients with addiction had a total depression degree (22.25) which was higher than that of control subjects (9.1). The difference in depression degree between patients and control subjects was statistically significant ( $p=0.000$ ). The level of vitamin D had approximate levels (in addictive patient group) ( $15.5\pm 4.6$  ng/ml) and control subjects ( $14.5\pm 7.6$  ng/ml). The difference in vitamin D level between study groups was not statistically significant ( $p=0.550$ ). The level of thyroid stimulating hormone was  $1.23\pm 0.67$  ng/ml in patients (with addiction group) and this was significantly ( $p=0.001$ ) lower than that of control subjects  $2.83\pm 2$  ng/ml.

**Table III:** The impact of addiction on depression, vitamin D, and TSH

| Variable          | Addiction | No | M     | SD   | P value |
|-------------------|-----------|----|-------|------|---------|
| Depression degree | No        | 21 | 9.1   | 8.8  | 0.000   |
|                   | Yes       | 36 | 22.25 | 13   |         |
| Vitamin D (ng/ml) | No        | 21 | 14.5  | 7.6  | 0.55    |
|                   | Yes       | 36 | 15.5  | 4.6  |         |
| TSH (ng/ml)       | No        | 21 | 2.83  | 2    | 0.001   |
|                   | Yes       | 36 | 1.23  | 0.67 |         |

## Discussion

The present study was conducted to evaluate the level of depression among addicted patients, to evaluate the level of vitamin D of addicted patients, and to evaluate the level of thyroid stimulating hormone of addicted patients.

The study findings did not show that demographic variables were significantly varied between patients with addiction and control subjects ( $p>0.05$ ) for all variables which pointed out to have no differences due to demographical variables, but some trends should not be ignored. As an example, the majority of patients in this study (about 72%) had low level of education. This trend of educational impacts on addiction agrees with the results obtained by Crum et al <sup>(13)</sup> who found that the less educational level was positively associated with addiction. The majority of patients in this study (about 83%) were singles. This trend also agreed with that reported by Patrick et al <sup>(14)</sup> who found that singles were more likely to be engaged in addiction sessions. The majority of patients (about 83%) had low income (<400 JD). This trend of having low income and being addicted may be difficult to be explained because those with lower economic status may find difficulties to obtain or access the addicted materials including alcohol. However, research findings did not show consistent findings in this regard. Demographical variable variations among study groups were not one of study objectives, but their assessment was mandatory to exclude their impacts.

It was interestingly to find smoking is common among all patients, while only two control subjects were smokers. This implies that smoking is highly plausible to be considered as a potential predictor of addiction. This finding agrees with other studies that reported the association between smoking and addiction to alcohol and other substances.<sup>(15-17)</sup> Although smoking was not intended to be measured as a main factor in the study objectives, but it was important to be mentioned in the discussion.

The level of depression was significantly higher in patients compared with control subjects ( $p=0.042$ ). In literature, the relationship between depression and the substance use is not well understood. It is also not clear which comes first the mental problem or the substance use.<sup>(18, 19)</sup>

The results of our study did not show a significant relationship in the level of vitamin D between patients with addiction and control subjects ( $p=0.550$ ). Across the literature, studies have showed contradicted results. While some studies have confirmed a correlation between depression and low vitamin D levels among elderly persons<sup>(8, 9)</sup>, other studies agree with our findings which did not show a positive relationship between depression and vitamin D level.<sup>(7)</sup> However, up to the best knowledge of the authors, studying depression, vitamin D, TSH among addictive patients was not likely to be investigated in one study.

The results of this study showed that patients with addiction had significantly lower levels of TSH compared with control subjects ( $p=0.001$ ). Previous studies including the study of Forman-Hoffman and Philibert<sup>(11)</sup> reported similar findings and showed an association between lower TSH and existing depressive syndrome in men.

## Conclusions

Patients with addiction had high level of depression, which is not associated with low level of vitamin D, but with low TSH level.

### Study limitations:

The main limitations of the present study included the low number of addictive patients, and the difficulty to collect samples in a convenient time.

### Recommendation:

The authors recommend to conduct further studies with larger size, and to measure more biochemical tests such as other thyroid functional tests.

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