

# Immunological and Physiological Study of Patients with Psychological Stress

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## Abstract

**Background:** Stress was associated with certain psychological diseases such as Alzheimer's, Schizophrenia and Major Depression diseases. **Objectives:** The objective of the current study was to assess the levels of some immunological parameters (IL-1 $\beta$ ) and (GAD 65) and physiological parameters serotonin and Dopamine **Materials and methods:** Five ml of blood were collected from patients and apparently healthy control(AHC) groups, by using disposable syringe then transported to a plain tube and left to clot at room temperature (20-25°C) for 15 min. The coagulated blood was centrifuged at 2500 rpm for 15 min; and then, serum was collected and distributed into aliquots of 0.25 ml in Eppendorf tubes for immunological and physiological tests. **Results:** Results of immunological parameters showed that there are a significant high ( $p \leq 0.05$ ) in the levels of IL-1 $\beta$  in each patients groups in comparison with AHC group. Also, the data appeared that there are a significant high ( $p \leq 0.05$ ) in GAD65 levels in each patients in comparison with AHC group. The current results about physiological tests appeared that there are significant low ( $p \leq 0.05$ ) in serotonin and dopamine hormones in all patients groups compared with AHC group. **Conclusion:** From the present study concluded that there was inverse relationship in psychological stress diseases (Alzheimer, Schizophrenia and depression diseases) between immunological parameters (IL-1 $\beta$  and GAD65) and physiological parameters (Serotonin and dopamine hormones).

**Keywords:** Stress, Alzheimer disease, Schizophrenia disease, Depression disease, IL-1 $\beta$ , GAD65, Dopamine, Serotonin

## 1. Introduction

Stress is unavoidable in today's world. Juggling multiple duties and responsibilities, interpersonal problems, unemployment financial worries, Bereavement, job strain, caregiving for a relative with a chronic disease, over-exercising and many more stressful situations are examples of stressful situations. Numerous studies have shown that psychological stress has an impact on immunological function (1). Stress was associated with certain psychological diseases such as AD is a deteriorating nervous condition described by neuron degeneration, memory damage, learning impairment, and major changes in personality and behavior (2). Psychological morbidities are high among undergraduate medical students. They experience the transition between pre/para-clinical and clinical training as a stressful period, and cope differently (3), also AD is associated with significant burden on caregivers and the healthcare system due to increased medical needs and expenditures required to care for patients with AD (4). Another disease associated with psychological stress was Schizophrenia is a mental condition characterized by negative symptoms like diminished motivation and expressiveness and cognitive impairments like weak executive functions, memory, and mental processing speed, as well as psychotic symptoms like hallucinations, delusions, and disorganized speech (5). One of the top ten causes of impairment globally and one that affects about 1% of the world's population is

schizophrenia. While some people with schizophrenia are profoundly disabled, others are able to function at a high level, showing that persons with schizophrenia have a wide variety of abilities in their daily lives (6). In addition, major depression disease (MDD) was also related to the psychological stress that are a global concern and the top source of burden and impairment worldwide (7). Any accurate diagnostic or early risk assessment markers, such as pleomorphic cytokines like interleukin-1 (IL-1 $\beta$ ) and tumor necrosis factor- $\alpha$  (TNF- $\alpha$ ), are crucial for major depression. As a result of diseased states, serum levels of these variables may differ from person to person (8). In addition, certain studies (9) described an rise in density of GAD65 and GAD67 immunostained neurons in (MDD) and bipolar disorder. Serotonin hormone is one of the neuromediators, and acts on the functioning of the central nervous system (CNS) and cardiovascular, renal, immune and gastrointestinal systems; any disorder in the synthesis, metabolism and reuptake of serotonin leads to symptoms and diseases such as schizophrenia, depression, obsessive-compulsive disorder (OCD) and learning disability (10)(11), furthermore, immunological cells in the spleen, bone marrow and circulatory system can be impacted by dopamine hormone (12), In addition, can be created and released by immune cells themselves (13).

## 2. Materials and Methods

### Study groups and blood samples collection

The current study was conducted on 90 persons

their ages ranged from 19-92years . The study population was divided into four groups: first group include 30 of apparently healthy control (AHC) and three groups which include 60 of patients with psychological stress distributed into 20 patients for each Alzheimer, schizophrenia and major depression diseases. Five ml of blood was obtained from patients and AHC groups by venipuncture by using disposable syringe , then transported to a plain tube and left to clot at room temperature (20-25°C) for 15 min. The coagulated blood was centrifuged 2500 rpm for 15 min; and then, serum was collected and spread into aliquots of 0.25 ml in Eppendorf tubes for immunological and physiological tests which were frozen at -20°C until laboratory assessments (14).

### Immunological and Physiological Assays

ELISA Reader and washer / (Biotek / USA ) was used to estimate the immunological and physiological parameters that include IL-1 $\beta$  , GAD 65 , serotonin and dopamine in serum using human enzyme-linked immunosorbent assay kit (Sunlong /China).

#### Statistical Analysis

The data were given as mean and standard error (SE), and one way analysis of variance was performed. ANOVA data analysis was performed using IBM SPSS Program version 20 and a post hoc test to identify significant differences between means (15).

#### Ethical approval

The study was carried out in conformity with the ethical standards set forth in the Helsinki Declaration. Before a sample was taken, it was done with the patient's verbal and analytical consent. A local ethics committee examined and approved the study protocol, subject information, and permission form in accordance with document number 1049 (containing the number and the date in 12/2/2022) to receive this approval.

## 3. Results

### Immunological parameters

#### IL-1 $\beta$

Table (1): The levels of IL-1 $\beta$ (Mean $\pm$ SE) in psychological stress patients and AHC groups .	
Parameter Groups N=90	IL-1 $\beta$ (pg/ml)
AHC group	A 10.04 $\pm$ 0.75
Alzheimer patients	C 34.27 $\pm$ 3.39
Schizophrenia patients	C 31.56 $\pm$ 3.02
Major depression Patients	B 24.10 $\pm$ 0.98

Note: At ( $p \leq 0.05$ ), different letters signify a significant difference.

#### GAD 65

Table (2): The levels (Means $\pm$ SE) of glutamic acid decarboxylase 65 (GAD 65) in psychological stress patients and AHC groups .	
Parameter Groups N=90	GAD 65 (pg/ml)
AHC group	A 19.91 $\pm$ 1.41
Alzheimer patients	B 51.08 $\pm$ 4.12
Schizophrenia patients	BC 45.89 $\pm$ 2.97
Major depression patients	C 38.94 $\pm$ 1.57

Note: At ( $p \leq 0.05$ ), different letters signify a significant difference.

### Physiological parameters

#### Serotonin

Table (3): The levels of serotonin(5-HT) (means $\pm$ SE) in psychological stress patients and AHC groups.	
Parameter Groups N=90	Serotonin (pg/ml)
AHC group	B 47.25 $\pm$ 3.37
Alzheimer patients	A 25.26 $\pm$ 2.68
Schizophrenia patients	A 23.59 $\pm$ 1.79
Major depression patients	A 22.74 $\pm$ 1.69

Note: At ( $p \leq 0.05$ ), different letters signify a significant difference.

#### Dopamine

Table (4): The levels of dopamine (means $\pm$ SE) in psychological stress patients and HAC groups.	
Parameter Groups N=90	Dopamine (pg/ml)
AHC group	B 217.38 $\pm$ 9.73
Alzheimer patients	A 145.59 $\pm$ 5.46
Schizophrenia patients	A 153.87 $\pm$ 6.27
Major depression patients	A 131.39 $\pm$ 4.71

Note: At ( $p \leq 0.05$ ), different letters signify a significant difference.

## 4. Discussion

### Effect of psychological stress diseases on immunological parameters

The present results appeared a significant high ( $p \leq 0.05$ ) in the levels of IL-1 $\beta$  in Alzheimer patients that appear in table (1) compared AHC group and these results were in coordinated with previous studies (16), also there are significant high ( $p \leq 0.05$ ) in IL-1 $\beta$  levels in schizophrenia patients in comparison with AHC group and these results were in coordinated with certain studies (17) that appeared TNF- $\alpha$ , IL-1  $\beta$ , and IL-6 levels were shown to have significantly increased, and inflammation caused by dysregulated cytokines and altered antioxidant systems may be a major contributor in the etiology of schizophrenia. Furthermore, there are significant increase ( $p \leq 0.05$ ) in IL-1 $\beta$  levels in major depression patients compared AHC group and these results were agreement with previous studies(18) that indicated a greater increase in major depression symptoms was preceded by a higher production capability of the pro-inflammatory cytokine IL-1 $\beta$ . Data in table (2) revealed that a significant high ( $p \leq 0.05$ ) in the levels of GAD65 in Alzheimer patients in comparison with AHC group and these results consistent with previous studies(19) that showed GABAergic system in AD were inconclusive and reported either no change or reduction of GAD enzyme activity, contrasting with an increase in GAD mRNA expression and either increase, no change, or reduction of GABA levels and GABAT activity. Also , there are a significant high ( $p \leq 0.05$ ) in GAD65 in schizophrenia patients compared with AHC group and these results was agreement with certain studies (20) that demonstrated brain inflammation linked with high serum anti-GADAb titers can be a cause of schizophrenia.

### Effect of psychological stress diseases on physiological parameters

Data in table (3) is appeared a significant low

( $p \leq 0.05$ ) in serotonin hormone levels in patients with Alzheimer disease compared with AHC group and these results were in agreement with study of (21) that showed decreases in serotonin level in the brain of Alzheimer's patients which can lead to numbness, learning disabilities and aging. Also, there was a significant decrease ( $p \leq 0.05$ ) in serotonin hormone levels in patients with Schizophrenia disease compared with AHC group and these results were in agreement with the study (22) that indicated at least a subset of schizophrenia patients has a pathogenic role for the serotonin system. Furthermore, there are a significant low ( $p \leq 0.05$ ) in serotonin hormone levels in major depression patients compared with AHC group and these results was in coordinated with previous studies(23) that appeared a lacks in serotonin innervation connected with progress, chronic stress or brain damage may lead to depression. Data in table (4) was revealed a significant low ( $p \leq 0.05$ ) in dopamine hormone levels in patients with Alzheimer disease compared with AHC group and these results were agreement with previous studies (24) that showed the dopamine level could be depleted in brains with Alzheimer's pathology. The current results also appeared a significant low ( $p \leq 0.05$ ) in dopamine hormone level in patients with schizophrenia patients compared with AHC group and these results were in consistent with previous studies(25) that showed 498 schizophrenic members, self-reported symptom reduction across all dopamine-targeting antipsychotic drugs was approximately 60 percent, showing that there is a association between dopamine antagonism and improved schizophrenic symptoms, as well as there are significant low ( $p \leq 0.05$ ) in dopamine hormone levels in patients with major depression patients compared AHC group and these results were agreement with the results of (26) that showed there are abnormality in the dopaminergic system of the patients. Mothers, who care for the majority of thalassemic children, have a variety of psychosocial issues(27).

## 5. Conclusion

In conclusion from the present study, it was concluded that there was inverse relationship in psychological stress diseases (Alzheimer, Schizophrenia and depression diseases) between immunological parameters (IL-1 $\beta$  and GAD65) and physiological parameters (Serotonin and dopamine hormones).

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