Stressful life events and Physiological Immunity as Predictors of Psychosomatic Symptoms among a Sample of Diabetic Foot Patients

Noha Gamal Abdel Hafeez[1] **&** **Asmaa Abdel Menam Ameen**[2]

Maisoon Eshak Fouad[٣]

Abtract:

Psychosomatic symptoms have received considerable study and attention from researchers, but there is a paucity of studies examining their relationship to Stressful life events and physiological immunity in diabetic foot patients, The current study aims to reveal the Stressful life eventsand physiological immunity contribute to the prediction of psychosomatic symptoms in a sample of diabetic foot patients, The study sample consisted of 60 patients with diabetic foot, with an age range between 40 and 70 years, a mean age of 57.32 years, and a standard deviation of 13.3 years. The sample included 39 males and 21 females, The study results demonstrated the extent to which Stressful life events and physiological immunity contribute to the prediction of psychosomatic symptoms, The research results revealed the extent to which Stressful life events and physiological immunity contribute to psychosomatic symptoms. Underscores the urgent need for integrated approaches that simultaneously address psychological and immunological health

Keywords: Stressful life events, Physiological Immunity, Psychosomatic Symptoms, Diabetic Foot Patients.

[1]**Assistant Professor in the Department of Psychology, Faculty of Arts, Beni-Suef University ،Beni-Suef،** noha2017gamal@gmail.com**, 01144382207.**

[2]**Assistant Professor in the Department of Psychology, Faculty of Arts, Beni-Suef University, Beni-Suef،** asmaa_menim@yahoo.com **، 01092515862.**

[3]**Lecturer in the Department of Psychology, Faculty of Arts, Beni- Suef University Beni-Suef**, maisoneshak@gmail.com**, 01285993308.**

Introduction

A stressful event is understood as a sudden change in the context to which a person is exposed, causing alterations that require adjustment processes. These changes are referred to as "life events," and they are objective experiences that cause significant readjustment or changes affecting both physical and psychological well-being. They require the person to take actions or make changes in their behavior to restore the lost balance) Maquet, etal,2020, Nayak & Nayak, (2023).

When a person perceives stressful life events, negative emotions are triggered, which in turn activate the hypothalamus and the sympathetic nervous system. This activation leads to excessive cortisol secretion, which contributes to increased inflammation. Continued inflammation increases the risk of chronic diseases such as cancer, cardiovascular diseases, and diabetes (Turner, etal ,2020).

Found that high cortisol levels were linked to decreased T cell activation and proliferation in patients with chronic stress, emphasizing how elevated glucocorticoids can impair adaptive immune responses, increasing vulnerability to infections and reducing vaccine efficacy (Zhang, et al,2020, Jiang, et al,2024).

tress causes molecular and immunological modulations, altering immune function and response to infection and disease. Severe stress can create an anergic state in the immune

system, reducing protective immunity and increasing vulnerability to infection (Fabian, etal, 2022)

If the immune system’s response to stress evolved through natural selection, a healthy organism would not be expected to be negatively affected by the activation of this response, as such a disadvantage would likely have been eliminated over generations. Although there is direct evidence that the relationship between stress and physiological immunity can increase disease susceptibility—particularly in animal studies—evidence supporting this link in healthy humans remains limited. This suggests that the immune system possesses a high degree of flexibility and adaptability, allowing it to cope with stress-induced changes without necessarily compromising the body's resistance to illness under normal conditions (Segerstrom, Miller,2004), The positive relationship between the frequency of stressful events and weakened immune function aligns with the general trend of findings across the literature, which confirm the negative impact of stressful life events on the efficiency of the immune system (Klopack,2022,Cohen,2016),The

researchers hypothesized that stressful events cause immune changes over time, leading to a reduction in immune defense, which contributes to the development of various psychosomatic disorders (Penz, etal,2018).

This study aimed to examine the relationship between stressful life events and the level of psychosomatic (psychosomatic) disorder. The study sample consisted of 120 patients with various dermatological conditions who attended the Dermatology and Venereology Hospital at Damascus University. The findings revealed a statistically significant relationship between the level of psychological stress resulting from stressful life events and each of the following: the level of psychosomatic disorder, emotional and physical aspects as measured by the Cornell Index, and the occurrence of skin diseases among individuals. However, no significant differences were found in the level of psychological stress based on gender or age variables In this context, for a long time, psychosomatic symptoms were believed to result solely from genetic makeup and the body's biological functions, especially when these symptoms manifested physically. However, recent studies over the past decades have highlighted the importance of psychological balance and mental health in reducing the appearance of these symptoms and enhancing the body's immunity (Saud, ,2014).

Studies in psychoneuroimmunology have shown that thoughts, emotional patterns, and psychological dynamics are closely interconnected with immune responses. Moreover, immune mechanisms not only regulate an individual's health but also play an important role in the process of individual adaptation to the environment. In multiple studies, the outcomes of both treatment approaches—pharmacological and psychosocial interventions—have been observed and compared in patients suffering from psychological issues linked to immune reactions (such as diabetes). Psychosocial interventions have demonstrated increasing effectiveness in reducing psychosomatic symptoms and improving immune system function (Vasile, 2020, Dawi, et al,2025).

Research in the field of psychoneuroimmunology suggests that understanding the interactions between the brain and the immune system significantly contributes to deepening our knowledge of the mechanisms of health and disease, as well as the role of psychological stress in influencing health. It is likely that the future of research in this field will be closely linked to a deeper understanding of stress-induced immunodeficiency and the diagnostic significance of immune system function changes resulting from psychosocial factors. (Cristian Vasile,2020, Green, et al, 2023)

A study (Cohen et al., 2019) has indicated the ability of stressful events to

predict an increase in the occurrence of psychosomatic symptoms, for a long time, psychosomatic symptoms were believed to result solely from genetic makeup and the body's biological functions, especially when these symptoms manifested physically. However, recent studies over the past decades have highlighted the importance of psychological balance and mental health in reducing the appearance of these symptoms and enhancing the body's immunity.

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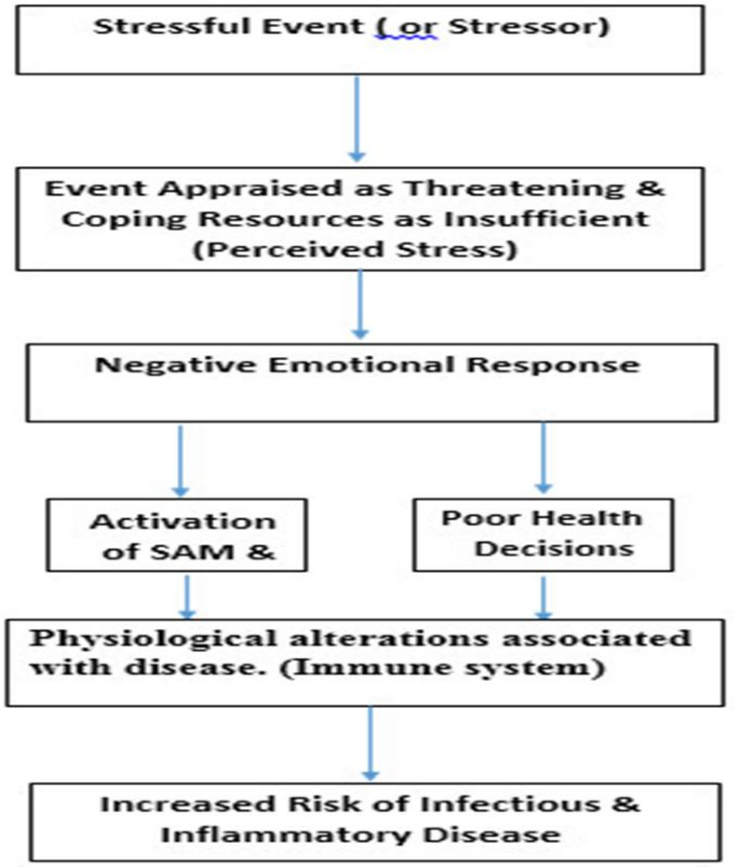
A review of the scientific literature investigated life events—particularly stressful or traumatic ones—among patients with diabetes-related foot complications. There is very limited data on the lived experiences of patients suffering from infections and diabetic foot ulcers. Some studies have focused on the potential consequences of infection, such as amputation, where immobility and a restricted social life are common concerns, although the site of the amputation may act as a confounding factor in these findings. Some evidence suggests that stressful life events experienced by patients who have undergone amputation may be more severe than those reported by patients with diabetic foot ulcers, due to both physical and psychological suffering, as well as the presence of permanent disability, In addition to Psychosomatic patients typically cannot feel or express their psychological state appropriately, and they tend to focus on their physical distress rather than expressing their psychological feelings (Lei Li ,etal, 2023, Zhang, Wang, etal,2023).

Diabetic foot is a multifactorial condition resulting from the interaction of various biological, psychological, and environmental factors. The diathesis–stress model is one theoretical framework that explains how exposure to life stressors can lead to weakened physiological immune responses in some individuals. However, not all people who experience stress develop this immune vulnerability, suggesting that individuals' evaluations and

interpretations of stressful events may play a significant role in influencing the strength and stability of their physiological immunity. Therefore, understanding cognitive processes is increasingly important in preventing complications and improving adaptation to the condition (Maquet ,etal,2020).

Over the past three decades, more than 300 studies have examined the relationship between life stressors and immune function in humans. Collectively, these studies have shown that psychological challenges can lead to significant alterations in immune responses. In this study, we aim to consolidate the existing empirical knowledge on the effects of psychological stress on physiological immunity through a meta-analysis. Given the complexity of both constructs—life stressors and physiological immunity—our objective is to highlight the types of psychological stressors that most significantly affect immune function, with a particular focus on patients with diabetic foot, who may be especially vulnerable to the impact of such stress due to their chronic health condition.

Patients with diabetic foot confirmed their suffering from elevated negative emotions, a higher frequency of stressful life events, increased perceived stress, more negative evaluations of situations, and a lower sense of perceived control. The binary logistic regression model indicated that poor perceived control over stressful events was the most determining factor, followed by negative evaluation of the situation (Ganesan & Orgill, 2024, Tesio, etal,2025).



The model begins with environmental events (stressful life events), where the brain determines whether they are perceived as threatening or not. If they are identified as threatening (perceived distress), negative emotions such as anxiety and fear are triggered, which in turn activate two main systems: The Hypothalamic-Pituitary-Adrenal (HPA) axis and the Sympathoadrenal medullary (SAM) system, along with other neuroendocrine and regulatory systems such as the parasympathetic nervous system. These negative emotions also lead to harmful health behaviors such as poor sleep and increased smoking. As shown in Figure (2), these responses lead to physiological changes in systems like the immune and cardiovascular systems, which are linked to disease and increase the likelihood of developing or exacerbating it (Cohen, etal, 2016).

The aims of the present study

The main objective of this study is to examine the associations between stressful life events and physiological immunity. In addition, the study aims to predict psychosomatic symptoms in patients with diabetic foot based on these variables.

Statement of the Problem:

Patients with diabetic foot suffer from a range of psychosomatic symptoms that cannot be fully explained by organic medical factors alone. Given the complex interaction between psychological stress and physiological responses, it becomes essential to explore the extent to which life stress events and physiological immunity contribute to the emergence of these symptoms. Accordingly, the current study is concerned with the following question:

To what extent do life stress events and physiological immunity contribute to the prediction of psychosomatic symptoms in patients with diabetic foot؟

Hypotheses.

Due to the limited research on the contribution of stressful life events and physiological immunity in predicting psychosomatic symptoms among patients with diabetic foot, the current study aimed to examine the relationships between stressful life events, physiological immunity, and psychosomatic symptoms. Based on previous research findings, the study suggested that physiological immunity and stressful life events can predict psychosomatic symptoms in a sample of patients with diabetic foot.

Materials and method

Participants

The study sample consisted of 60 patients with diabetic foot, with an age range between 40 and 70 years, a mean age of 57.32 years, and a standard deviation of 13.3 years. The sample included 39 males and 21 females.

Equivalence was ensured among the sample members in terms of Marital status and social and economic status, as all participants were married and of middle income.

A set of criteria had to be met by the participants, as follows:

1. Duration of illness: Not less than 5 years.
2. Severity of the condition: Ranging from severe ulcers to amputation.

3. Level of physiological immunity: weakened physiological immunity, determined using the Complete Blood Count (CBC) test, where the WBC count was less than 4 or more than 11 cells per microliter.
4. No chronic physical illnesses.
5. No history of psychological or neurological disorders.

After applying the research tools to the sample, an Direct relationship was found between stressful life events and weakened physiological immunity, in addition to the contribution of these variables in predicting psychosomatic symptoms among patients with diabetic foot.

Stressful Life Events Scale

The study used a modified version of the Stressful Life Events Scale developed by Vinson et al. (1993) to better suit the characteristics of the current sample. The adapted scale consists of 30 items, including 22 positively worded items and 8 reverse (negatively worded) items. Participants were asked to respond to each item using a four-point Likert scale: "Never," "Sometimes," "Often," and "Usually." This scale was used to assess the impact of stressful life events experienced by diabetic foot patients.

Physiological Immunity

One of the key instruments used in this study was the Complete Blood Count (CBC) analysis. A 2 ml venous blood sample was collected from the forearm of each participant and immediately analyzed using a CBC device. This device specializes in determining both the percentage and absolute count of white blood cells (WBCs), which served as the primary biomarker for physiological immune efficiency in the current research. Based on established clinical immunological standards, WBC values lower than 4×10^9/L (leukopenia) or higher than 11×10^9/L (leukocytosis) are indicative of immune system dysfunction or physiological imbalance. These deviations may signal a compromised immune response, which is of particular concern in individuals with chronic health conditions such as diabetic foot. This immunological parameter is widely acknowledged in both clinical and research domains as a reliable and essential indicator of immune competence (Klein & Eliason, 2019; Mayo Clinic, 2022).

Psychosomatic Symptoms Scale

Cornell Medical Index (CMI) for Somatic and Psychological Symptoms

Forty years after the release of the first edition of the Cornell Medical Index in 1942, a team of researchers — Keith Bornstein, Albert Rochman, Harold Doolittle, and Paul Meskofitch — revised the instrument in 1986. This updated version, supported by the local committee under the supervision of Mahmoud Abu El-Nil (1995), expanded the original 101 items across 10 subscales to a total of **223 items distributed over 18 subscales**.

Based on the nature of the study sample, the selected subscales include those related to the **respiratory**, **digestive**, **skeletal**, and **nervous systems**, in addition to the **anxiety** and **depression** subscales. The total number of items selected for this study is **81**.

The index contains a series of questions related to general health and various physical and psychological conditions. Respondents are instructed to answer honestly and sincerely, as there are no right or wrong answers — only whether or not each item applies to them.

If the item applies, the respondent marks **"Yes"**; if it does not apply, they respond **"No"** or leave it unmarked.

Each subscale is scored independently, with one point awarded for every item to which the respondent answered "Yes."

Procedure

The level of immunity was measured through a blood test, The Stressful Life Events Scale, and the Cornell Psychosomatic Symptoms Checklist were randomly administered to diabetic foot patients at the Egyptian Diabetic Foot Center affiliated with the Greek Hospital during working hours. All participants were volunteers and gave their verbal consent. The assessments were conducted by the researchers with the assistance of a team of specialists holding master's or doctoral degrees in psychology.

Ethical procedure

The study received approval from the relevant authorities in accordance with established ethical standards, with rigorous procedures followed to ensure the protection of participants' rights and well-being. Comprehensive information about the study's objectives and nature was provided to each participant, and Oral informed consent was obtained prior to data collection. Confidentiality of personal information and the privacy of participants were strictly maintained in accordance with ethical guidelines for scientific research.

Ethical approval was obtained from the National Institute of Diabetes and Endocrinology in Cairo, following the approval of the institution overseeing the research team and their assistants. Subsequently, informed consent was obtained individually from each participant. Issues of informed consent, confidentiality, and privacy were strictly respected.

Data analysis

SPSS, Inc. (2016) was used for the statistical analysis of the data. Descriptive statistics, and stepwise regression analysis.

Results

Table 1: The means, standard deviations, and test–retest reliability coefficients are presented for the study variables, which include stressful life events, physiological immunity, and the dimensions of psychosomatic symptoms.

Table 1: Means, standard deviations, reliabilities.

Variables	Mean	Standard Deviation	Test–Retest Reliability
Total Score of Stressful Life Events	79.08	3.01	0.79
Respiratory System	10.02	0.51	0.75
Digestive System	14.04	0.76	0.78
Musculoskeletal System	8.12	0.42	0.69
Nervous System	12.01	0.59	0.79
Anxiety	5.02	0.39	0.63
Depression	3.12	0.17	0.64
Total Score of Psychosomatic Disorders	52.33	2.84	0.77

Table 2: Correlation between Physiological Immunity and Life Stress Events

Variables	Physiological Immunity	Life Stress Events
Physiological Immunity	1.00	0.83
Total Life Stress Score	0.85	1.00
Respiratory System	0.85	0.82
Digestive System	0.83	0.81
Skeletal System	0.71	0.70
Nervous System	0.81	0.79
Anxiety	0.54	0.78
Depression	0.51	0.75
Total Psychosomatic Disorders Score	0.81	0.79

The previous table 2: indicates a strong direct correlation between weakened physiological immunity and stressful life events. There is also a strong positive correlation between symptoms of the respiratory, digestive, musculoskeletal, and nervous systems and both weakened physiological immunity and stressful life events. Furthermore, there is a moderate direct correlation between anxiety and depression and weakened physiological immunity. A strong direct correlation also exists between anxiety and depression and stressful life events. Additionally, there is a strong direct correlation between psychosomatic symptoms and both weakened physiological immunity and stressful life events.

Table3: Multiple Regression Analysis Predicting Psychosomatic Disorders

Predictors	R	R^2	ΔR^2	Adjusted R^2	F-value	Sig. (F)	Constant	Regression Coefficient (B)	t-value	Sig. (t)
Physiological Immunity	0.704	0.352	0.352	0.264	51.442	0.000	59.803	-9.023	-7.581	0.000
Physiological Immunity + Life Stress Events	0.844	0.712	0.151	0.405	39.673	0.000	101.224	7.805 (Stress) 0.944 (Immunity)	6.733 (Stress) 4.022 (Immunity)	0.001 0.001

The previous table indicates the following:

1. Weakened physiological immunity and stressful life events can predict psychosomatic symptoms among a sample of diabetic foot patients.

2. The F-value is statistically significant at the 0.001 level, which indicates the significant impact of the independent (predictor) variables on psychosomatic symptoms.

3. The predictor variables contributed 50.3% to the explanation of the variance in psychosomatic symptoms among the sample. Specifically, weakened immunity accounted for 35.2%, followed by stressful life events, which contributed 15.1% to the explained variance.

4. Based on the previous table, the regression equation can be formulated as follows:
   Dependent Variable = Constant + (Regression Coefficient 1 × Predictor 1) + (Regression Coefficient 2 × Predictor 2)
   → Psychosomatic Symptoms = 101 .22+ (-9.02 × Physiological Immunity) + (7.80 × Stressful Life Events)

Stepwise multiple regression analysis indicates that weakened physiological immunity and stressful life events can predict psychosomatic symptoms.

Discussion

The main purpose of the present study was to Examine the extent to which Stressful life events and physiological immunity contribute to the prediction of psychosomatic symptoms in diabetic foot patients. Data analysis indicated an direct relationship between Stressful life events and weakened physiological immunity, and that these variables contributed to the prediction of psychosomatic symptoms in a sample of diabetic foot patients. Some studies have concurred with these findings, such as the study (Cao, etal,2023) (Cheng, etal,2021) (Meng, 2021) that indicated Stressful life events increases with the pressures of daily life, which negatively impacts physiological immunity. Stressful life events are associated with an increased risk of deficits and weakened physiological immunity.

These findings are consistent with several previous studies. For instance, Cao et al. (2023) confirmed that daily life stress has a negative impact on immune system performance. Similarly, Cheng et al. (2021) reported that prolonged exposure to stressful life events increases the risk of developing various psychosomatic disorders. Meng (2021) also found that chronic stress weakens immune system responses, which in turn raises the susceptibility to chronic illnesses—especially among diabetic foot patients who already suffer from impaired circulation and delayed wound healing, The study by Smith et al. (2020) reinforced these findings through a meta-analysis of 70 studies, concluding that psychological stress is one of the strongest predictors of psychosomatic symptoms such as muscle pain, sleep disturbances, and headaches, especially in the absence of adequate psychological and social support.

Based on the above, it can be said that psychological stress represents a major psychological and physiological factor that contributes to the increased severity of psychosomatic symptoms, especially among diabetic foot patients who suffer from a weakened immune system and difficulties in psychological adaptation to the disease.

"The model proposed by Brosschot et al. (2022) suggests that a persistent worrying style may lead to chronic activation of the autonomic nervous system, which contributes to the continuation of physical symptoms even after the external stressor has subsided. This may explain the persistence of certain diabetic foot symptoms despite adherence to medical treatment.

In the same vein, other studies such as Smith et al. (2020) have demonstrated that psychological interventions like cognitive-behavioral therapy (CBT) can effectively reduce the impact of psychological stress on immune function,

thereby lessening the severity of psychosomatic symptoms. Additionally, Lee et al. (2019) highlighted the importance of regular physical activity and a balanced diet in strengthening immunity and reducing the influence of stressful life events.

Conclusion

The Conclusion could be summarized in the following points:

- Stressful life events and physiological immunity alone were not sufficient to predict psychosomatic symptoms in this sample. This highlights the need for further research aimed at clarifying other variables underlying these symptoms and providing valuable insights for the development of appropriate guidelines and therapeutic frameworks.
- The results indicate that physiological immunity plays a greater role in predicting psychosomatic symptoms, particularly those related to the respiratory, digestive, musculoskeletal, and nervous systems. Additionally, the findings show that stressful life events have a stronger impact in predicting psychosomatic symptoms, especially anxiety and depression. Therefore, therapeutic strategies and preventive interventions should focus on improving physiological immunity and managing individuals' emotional responses to stressors, rather than simply counting stressful events, while taking into account age-related differences among patients**.**
- These findings highlight the necessity of integrating multidimensional intervention programs that focus on managing stressful life events and enhancing physiological immunity within the treatment plans provided to diabetic foot patients. Preventive, psychological, and medical interventions aimed at reducing exposure to stressful events and strengthening immune system efficiency are among the most critical factors that may contribute to alleviating psychosomatic symptoms and improving the quality of life for these patients.

Limitations

There are some limitations in this study that should be taken into consideration when interpreting the results. The primary limitation is the low response rate among participants with advanced diabetic foot ulcers, which may introduce bias and influence the observed changes in psychosomatic symptoms. However, this should not significantly affect the overall findings. Similarly, minor changes in the psychosomatic symptom questions due to the application in a Western context—as opposed to measuring the "current

experience" in an Eastern context—may lead to an overestimation of symptom prevalence, as a result of differences in certain habits and cultural norms. However, this is not expected to significantly affect the overall results. Moreover, evidence from previous studies demonstrates a strong relationship between stressful life events and physiological immunity. In future studies, it may be valuable to examine the relationship between psychosomatic symptoms, emotional regulation, and self-compassion, as this aspect was not addressed within the scope of our current study.

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أحداث الحياة الضاغطة والمناعة الفيسيولوجية كمنبئات بالأعراض النفسجسمية لدى عينة من مرضى القدم السكرى

أ.م.د/ نهى جمال عبد الحفيظ[٤]
أستاذ علم نفس الشخصية المساعد
كلية الآداب - جامعة بنى سويف.

أ.م. د/ أسماء عبد المنعم أمين[٥]
أستاذ علم النفس الارتقائي المساعد
كلية الآداب - جامعة بنى سويف.

د/ ميسون اسحق فؤاد[٦]
مدرس علم النفس الفسيولوجي
كلية الآداب - جامعة بنى سويف.

الملخص:

حظيت الأعراض النفسجسمية باهتمام ودراسة ملحوظة من قبل الباحثين، إلا أن هناك نقصًا في الدراسات التي تفحص علاقتها بأحداث الحياة الضاغطة والمناعة الفسيولوجية لدى مرضى القدم السكري. تهدف الدراسة الحالية إلى الكشف عن مدى مساهمة أحداث الحياة الضاغطة والمناعة الفسيولوجية في التنبؤ بالأعراض النفسجسمية لدى عينة من مرضى القدم السكري. تكونت عينة الدراسة من ٦٠ مريضًا بالقدم السكري، تراوحت أعمارهم بين ٤٠ و٧٠ عامًا، بمتوسط عمر بلغ ٥٧.٣٢ عامًا، وانحراف معياري قدره ١٣.٣ عامًا. تضمنت العينة ٣٩ ذكرًا و ٢١ أنثى.

وأظهرت نتائج الدراسة إلى أي مدى تساهم أحداث الحياة الضاغطة والمناعة الفسيولوجية في التنبؤ بالأعراض النفسجسمية، كما كشفت النتائج أن هذه المتغيرات تسهم بشكل كبير في ظهور الأعراض النفسجسمية، مما يؤكد على الحاجة الملحة إلى إتباع منهجيات تكاملية تعالج الصحة النفسية والمناعية في وقت واحد.

الكلمات المفتاحية:

أحداث الحياة الضاغطة، المناعة الفسيولوجية، الأعراض النفسجسمية، مرضى القدم السكرى

[٤] أستاذ علم نفس الشخصية المساعد، كلية الآداب - جامعة بنى سويف.
[٥] أستاذ علم النفس الارتقائي المساعد، كلية الآداب - جامعة بنى سويف.
[٦] مدرس علم النفس الفسيولوجي، كلية الآداب - جامعة بنى سويف.