



Evaluation of Anxiety, Depression, and Biological Markers in Health Professionals with Burnout Syndrome

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Abstract

Introduction: Medical profession is a stress factor for the development of burnout, symptoms of anxiety and depression as a result of 24-hour work, delayed work-life balance gratification and challenges associated with patient care.

Aim: This study aimed to verify the rates of burnout, anxiety, and depression presented by health professionals working 24-hour shifts under emergency conditions. Saliva cortisol and glycated hemoglobin were also studied as stress-related biomarkers.

Materials and methods: Ninety-five medical professionals – physicians, biologists, chemists, and laboratory technicians were compared to a control group working outside medicine. Burnout was measured by the Maslach Burnout Inventory. Anxiety and depression were measured by the State-Trait Anxiety Inventory and the Zung Depression Scale. Salivary cortisol and glycated hemoglobin were analyzed by the immunoassay methods.

Results: The level of burnout in the subscale of emotional exhaustion was high in 95.6% of medical professionals. In the subscale of personal accomplishment, 100% had high scores. Regarding the State-Trait Anxiety Inventory, 22.2% and 68.9% of the medical specialists showed a positive score (≥ 40) for S-anxiety and T-anxiety scale, respectively. 11.1% indicated greater anxiety (score ≥ 55) for T-anxiety. In relation to the depression scale, 31.1% had mildly depressive states and 8.9% had moderately depressive states. Participants with a high level of emotional exhaustion presented higher results for saliva cortisol and glycated hemoglobin compared to the control group. A significant positive correlation existed between the two dimensions - emotional exhaustion and depression ($r=0.683$, $p<0.01$).

Conclusions: Our study may be relevant for further research in order to decrease the negative aspects of professional stress.

Keywords

anxiety, burnout, depression, stress-related biomarkers

INTRODUCTION

The burnout syndrome occurring as a distress response leads to cognitive and emotional depletion, and inefficacy in the work environment. It is defined by the three dimensions of

emotional exhaustion, depersonalization, and reduced personal accomplishment.¹ Anxiety and depression disorders are the most prevalent mental health problems affecting human health. According to large population-based surveys lifetime prevalence of anxiety disorder is from 13.6% to 28.8% for the

general population in America and Europe, and the lifetime prevalence of the depressive disorder is from 13% to 16.6%.²⁻⁴

The medical profession is a stress factor for the development of burnout, symptoms of anxiety and depression as a result of long working hours, work-life imbalance and challenges in providing health care of the patients. The vulnerability of physicians to burnout syndrome is widely known, and the negative effects are emotional, physical and behavioural.⁵⁻⁷ Studies conducted among health professionals have found that burnout is a direct consequence of chronic exposure to stress factors. Some of the most important stressors include shift work, overtime work, managing highly demanding clinical interventions, inherent demands, and overall highly stressful environment. Some authors denote that the emotional exhaustion usually emerge as a first sign of the distress.⁸ Another study revealed that emotional exhaustion is not only associated with work-related factors, but also with physical activity and sleeping.⁹ Several studies have analyzed the relationship between demographic, social, occupational, and personality variables and the occurrence of burnout syndrome in health professionals. They have indicated that burnout is a worldwide problem in urgent services, oncology and primary care.¹⁰⁻¹² Medical professionals as a consequence of burnout may cause a variety of physical symptoms and feelings of anxiety, sadness, irritability, fatigue, and insomnia that result to reduced work efficiency and quality of patient care.¹³⁻¹⁶

Belonging to a special occupation population, doctors assume the responsibility of healing the wounded, rescuing the dying, and facing suffering, illness, and death daily. Therefore, doctors are at risk of suffering from mental illnesses.¹⁷ Some studies show that the prevalence of anxiety and depression in general practitioners in England are 19% and 10%, respectively.¹⁸ Among the emergency department doctors in Turkey, the attack rates of anxiety and depression are 14.6% and 15.1%, respectively.¹⁹ In the United States, 11.3% of middle- and old-aged doctors have depression symptoms, whereas, in Japanese private hospitals, doctors with depression symptoms account for 18%.^{20,21} Doctors who suffer from a mental illness not only decrease their life quality but also increase the probability of committing medical mistakes, endangering the safety of the patients they treat.

Various prospective studies have investigated different biomarkers involved in the hypothalamic-pituitary-adrenal (HPA) axis, autonomous nervous system (ANS), immune system, metabolic processes, antioxidant defence, and hormones (cortisol in saliva and blood, blood sugar, glycated haemoglobin, adrenocorticotrophic hormone, cholesterol, C-reactive protein, prolactin, fibrinogen, etc.) to identify potential stress biomarkers in associations with other symptoms of burnout (e.g. feelings of emotional exhaustion, detachment from work, and diminished competence).²²⁻²⁶ Other authors point out that age, saliva cortisol, and blood concentration of glycated haemoglobin (HbA1C) are significantly associated with emotional exhaustion in physicians.²⁷⁻²⁹

AIM

This study aimed to investigate the rates of burnout, anxiety, and depression in health professionals working 24-hour shifts under emergency conditions. Saliva cortisol and glycated hemoglobin were also studied as stress-related biomarkers.

MATERIALS AND METHODS

A total of 95 medical professionals - physicians, biologists, chemists and laboratory technicians were surveyed. A comparison group of 95 individuals working outside medicine was used as a control to verify the results. The control group participants were randomly selected when they were interviewed during routine laboratory investigations and met the criteria for inclusion in the survey after completing key demographic questionnaires. All participants were given a document about the objectives and procedures of the study. The study was approved by the Ethical Committee of the University of Plovdiv.

To assess the levels of burnout, anxiety and depression, we used the Maslach Burnout Inventory (MBI), the State-Trait Anxiety Inventory (STAI) and the Zung Self-Rating Depression Scale (SDS) which are the most commonly used certified tests in clinical practice in Bulgaria.³⁰⁻³² Salivary cortisol levels and glycated hemoglobin in whole blood were analyzed by immunoassay methods using the automatic devices (Beckman Coulter Systems). Venous blood and salivary samples were taken in the morning between 6 and 8 a.m., following the basic rules of specimen collection, and stored at -20°C until the time of the analysis, but for no longer than two months according to the manufacturer's instructions.

Data analysis was carried out using IBM SPSS Statistics (v.25) and significance was fixed at $p < 0.05$. Quantitative variables were presented as mean and standard deviation (SD). Qualitative variables were presented as occurrence (n) and standard deviation (SD). The Shapiro-Wilk test was used to test the normal distribution of all continuous variables. The absence of normal distribution and small sample size determines the use of nonparametric tests (Mann-Whitney) to compare the results between physicians and controls. Relationships between quantitative variables were found using a Pearson correlation test.

The study was conducted in accordance with the Declaration of Helsinki, the Principles of Good Clinical Practice, the Bulgarian laws and regulations for clinical and scientific research involving human subjects.

RESULTS

The study surveyed 95 health professionals – physicians (58%), biologists (10%), chemists (10%) and laboratory technicians (22%). The physicians were specialists in in-

ternal medicine, general surgery, and pathology. A control group of 95 individuals working outside medicine was used as controls to verify the results. There was no statistically significant difference between the two groups in terms of age, sex, and work experience ($p < 0.05$) (Table 1).

A diagnosis of burnout was made if a respondent presented with high levels in at least two subscales (either emotional exhaustion and/or depersonalization) associated or not with low personal accomplishment or in three subscales based on the following scores: emotional exhaustion over 26, depersonalization over 10, and personal accomplishment under 33. According to this, all of the participants showed no symptoms of burnout, but 95.6% of the health professionals exhibited a high score in emotional exhaustion subscale. In the subscale of personal accomplishment, 100% had high scores. In terms of the depersonalization subscale, all of the participants showed a low level. The distribution of burnout symptoms is shown in Table 2.

Regarding the STAI, 22.2% and 68.9% of the medical specialists showed a positive score (≥ 40) for S-anxiety and T-anxiety scale, respectively. 11.1% indicated greater anxiety (score ≥ 55) for T-anxiety. Concerning the depression scale, 31.1% had mildly depressive states and 8.9% had moderately depressive states (Table 3).

To assess biochemical variables associated with burnout, we analyzed saliva cortisol and glycated hemoglobin between the two groups of subjects. We found that health professionals with a high score on the subscale of emotional exhaustion demonstrated significantly higher values for these biomarkers compared with the control group (Table 4).

Correlation analysis of the variables in the three instruments (MBI, STAI, SDS) showed a significant positive correlation of moderate strength between the two dimensions - emotional exhaustion and depression ($r = 0.683$, $p < 0.01$) (Fig. 1).

Table 1. Characteristics of the study population

Variables	Health professionals (n=95)	Controls (n=95)	Mann-Whitney Test
Male % (n)	43.2 (45)	39.9 (42)	$p = 0.396$
Female % (n)	47.5 (50)	50.4 (53)	
Age, mean (SD)	46.5 (4.3)	44.8 (4.9)	$p = 0.394$
Work experience - years, mean (SD)	21.1 (5.6)	19.7 (4.3)	$p = 0.362$

Table 2. The extent of the degree of burnout symptoms in healthy professionals and controls

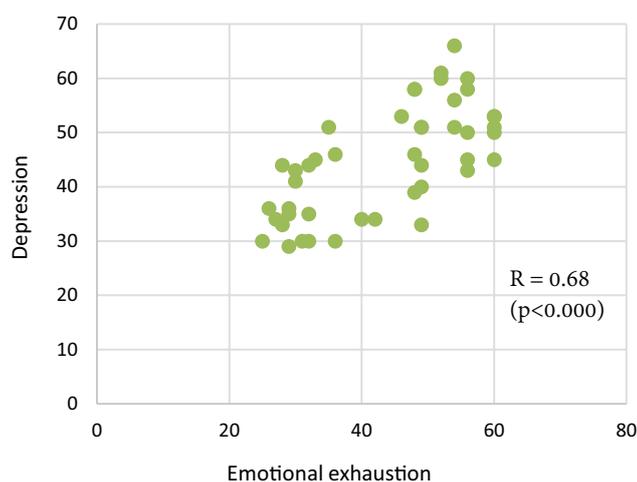
MBI dimensions	Health professionals (n=95)	Controls (n=95)	Mann-Whitney Test
Emotional exhaustion	low (<19)	0% (0)	100% (95)
	moderate (19-26)	4.4% (2)	0% (0)
	high (>26)	95.6% (93)	0% (0)
Depersonalization	low (<6)	100% (95)	100% (95)
Personal accomplishment	high (>39)	100% (95)	100% (95)

Table 3. Scores of anxiety and depression in study participants

	Health professionals (n=95)	Controls (n=95)	Mann-Whitney Test
S-Anxiety	no (<40)	71.1% (68)	84.4% (80)
	moderate (40-55)	22.2% (21)	15.6% (15)
	high (>55)	6.7% (6)	0% (0)
T-Anxiety	no (<40)	20.0% (19)	77.8% (74)
	moderate (40-55)	68.9% (65)	22.2% (21)
	high (>55)	11.1% (11)	0% (0)
Depression	no (<50)	60.0% (57)	100% (95)
	mildly (50-59)	31.1% (30)	0% (0)
	moderately (60-69)	8.9% (8)	0% (0)

Table 4. Biochemical parameters in the subjects of the study

	Health professionals with high EE (n=93)	Controls (n=95)	Mann-Whitney Test
Saliva cortisol, mean (SD)	35.32 (8.21)	16.51 (4.11)	$p < 0.000$
HbA1C, mean (SD)	5.31 (0.41)	4.97 (0.12)	$p < 0.000$

**Figure 1.** Correlation between depression and emotional exhaustion.

DISCUSSION

Burnout syndrome is a work-related state predominantly characterized by dysphoric symptoms, with emotional exhaustion as its core feature.³³ In the present study, 95.6% of the health professionals showed a high score of emotional exhaustion. Emotional exhaustion is thought to be the first symptom in Burnout's developmental dynamics as a prolonged response to chronic emotional and interpersonal job-related stressors. Some research have reported similar results - occupational stress is often associated with emotional exhaustion, which can lead to the loss of enthusiasm for work, feeling helpless, trapped and defeated.^{34,35}

The present study shows that 68.9% of the health professionals revealed a moderate score for T-anxiety and 11.1% had a high level of T-anxiety. In a cross-sectional study to the analyzed prevalence of anxiety and depression among doctors Atif K et al. reported that doctors showed mild to moderate grade of anxiety and strong positive relation between anxiety and depression scores in hospitalists.³⁶ Thus, anxiety as a personality trait is an additional risk factor that enhances the propensity for burnout. The anxiety usually results from excess stressors that most authors identify as traditional in the medical profession - work-related factors, personal characteristics and organizational factors.³⁷

In our study, the participants had mild to moderate depression in 31.1% and 8.9%, respectively. The present data on the significant positive correlation between emotional exhaustion and depression support the literature evidence of increased prevalence of various psychological problems (depression, anxiety, and burnout) among health professionals. According to the literature, stressors at work are a significant predictor of depression and burnout in the medical profession. The prevalence of moderate and severe depression was 12.2% in the study of stress, depression, and burnout among 459 hospital physicians in Croatia.³⁸ Grover S et al. in a cross-sectional study of psychological problems and burnout among 445 doctors in India also reported that 30.1% of the participants were found to have depression and more than 90% of the participants had some level of burnout.³⁹ The incidence of burnout and depression in physicians, as well as their correlations, were assessed in numerous studies.⁴⁰⁻⁴³ In a systematic review and some meta-analyses, for both burnout-depression and burnout-anxiety relationships, the results showed a significant association between burnout and depression and burnout and anxiety.⁴⁴ However, the authors concluded that future studies should focus on the use of longitudinal projects to assess the causal relationship between these variables.

Following the purpose of the study, our results showed that saliva cortisol and HbA1C were significantly higher in health professionals with a high score on the subscale of emotional exhaustion compared with healthy controls. Today, salivary cortisol is routinely used as a biomarker of psychological stress.²⁷ Metlaine et al. confirmed a significant prediction of HbA1C in professional burnout.²⁸ A recent study among health professionals working in a palliative care unit to evaluate the association between burnout dimensions and salivary secretion of cortisol showed that the release of cortisol in one-dimension burnout group was higher than that in the control group for cortisol response upon waking and at bedtime.⁴⁵ According to this we also found higher levels of salivary cortisol in one dimension - emotional exhaustion. Similarly, we found significant differences in the levels of HbA1C between controls and the group of health professionals with a high score in emotional exhaustion.

In addition, there are not many studies related to biomarkers among health professionals. Furthermore, the data from the meta-analyses indicate lack of unequivocal conclusions about potential stress biomarkers in burnout. Actually, most of the studies are not comparable concerning the

profession of the participants, methods used to characterize the different groups etc.⁴⁶⁻⁴⁸ Therefore, future studies in this field should be focused on possible relationship between burnout and stress biomarkers.

CONCLUSIONS

Our findings are consistent with other research that emphasizes the importance of the work stressor in the medical profession and may indeed be relevant for further research to improve the negative impact of work stress on physician's health and work quality.

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Оценка тревожности, депрессии и биологических маркеров у медицинских работников с синдромом выгорания

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Резюме

Введение: Медицинская профессия является источником стресса для развития выгорания, симптомов тревоги и депрессии в результате круглосуточной работы, отложенного удовлетворения от баланса между работой и личной жизнью и проблем, связанных с уходом за пациентами.

Цель: Это исследование направлено на проверку уровней выгорания, беспокойства и депрессии у медицинских работников, работающих круглосуточно в условиях чрезвычайной ситуации. Уровни кортизола и гемоглобина глюкозы в слюне были изучены как биомаркеры стресса.

Материалы и методы: Десятью пять медицинских работников – врачей, биологов, химиков и лаборантов – сравнивались с контрольной группой, состоящей из людей, работающих вне медицинской сферы. Выгорание измерялось тестом Маслаха. Тревога и депрессия измерялись с помощью шкалы состояния черты тревожности и шкалы депрессии Зунга. Уровни кортизола и гемоглобина глюкозы в слюне измеряли методами иммуноанализа.

Результаты: Уровень выгорания по подшкале эмоционального истощения был высоким у 95.6% медицинских работников. По подшкале личных достижений 100% имели высокие результаты. Что касается анкеты для оценки тревожности как состояния или характеристики, 22.2% и 68.9% медицинских работников показали высокие результаты (≥ 40) по шкале тревожности как состояния и тревожности как черты, соответственно. 11.1% показали более высокую тревожность (балл ≥ 55) по поводу тревожности как признака. Что касается шкалы депрессии, 31.1% имели лёгкие депрессивные состояния и 8.9% – умеренные депрессивные состояния. У участников с высоким уровнем эмоционального истощения были более высокие уровни кортизола в слюне и гемоглобина глюкозы по сравнению с контрольной группой. Существует значимая положительная корреляция между двумя измерениями – эмоциональным истощением и депрессией ($r=0.683$, $p<0.01$).

Заключение: Наше исследование может быть связано с дополнительными исследованиями по снижению негативных аспектов профессионального стресса.

Ключевые слова

тревожность, выгорание, депрессия, биомаркеры стресса
