

BIBLIOGRAPHIC INFORMATION SYSTEM

Journal Full Title: [Journal of Biomedical Research & Environmental Sciences](#)

Journal NLM Abbreviation: J Biomed Res Environ Sci

Journal Website Link: <https://www.jelsciences.com>

Journal ISSN: 2766-2276

Category: Multidisciplinary

Subject Areas: Medicine Group, Biology Group, General, Environmental Sciences

Topics Summation: 128

Issue Regularity: Monthly

Review Process: Double Blind

Time to Publication: 21 Days

Indexing catalog: [Visit here](#)

Publication fee catalog: [Visit here](#)

DOI: 10.37871 ([CrossRef](#))

Plagiarism detection software: iThenticate

Managing entity: USA

Language: English

Research work collecting capability: Worldwide

Organized by: [SciRes Literature LLC](#)


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**IndexCopernicus
ICV 2020:
53.77**

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SHORT COMMUNICATION

A Moderated Mediation Analysis between Burnout Components and Hair Cortisol

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ABSTRACT

In this research the relationship between hair cortisol and burnout was evaluated through the study of third-variables effect. Hair cortisol concentration was measured in 234 health workers. All participants completed perceived stress survey and Maslach Burnout Inventory. Our results showed that 40% of volunteers presented altered hair cortisol values, 12% burnout, 33% showed high depersonalization, 38% high emotional fatigue, 36% low personal fulfillment and 22% presented 2 of the 3 burnout components. A moderated mediation was found between psychological and biological variables. This research highlights the importance of including a biological variable such as hair cortisol in burnout assessment.

INTRODUCTION

In December 2019, a highly infectious Serious Acute Respiratory Syndrome caused by a novel coronavirus (SARS-CoV-2) emerged in Wuhan, China. On March 11th, 2020, The World Health Organization (WHO) declared COVID-19 a pandemic [1]. In previous studies of other outbreaks such SARS or Ebola, extraordinary amounts of pressure on Healthcare Workers (HCWs) were reported due to the sudden onset of a life-threatening illness [2]. In this population, high levels of stress, anxiety, and symptoms of depression associated with uncertainty, stigmatization, reluctance to work and resignation were observed [3]. In addition, several studies found that the emergency nursery department was more likely to develop distress and behavioral disconnection [4].

Chronic stress related to work environment, known as burnout, was adequately

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DOI: 10.37871/jbres1412

Submitted: 02 February 2022

Accepted: 04 February 2022

Published: 05 February 2022

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OPEN ACCESS

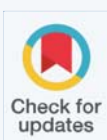
Keywords

- Stress; Burnout; Mediation analysis; Hair cortisol; Health workers

MEDICINE GROUP

PSYCHIATRY | ANXIETY | DEPRESSION | MENTAL HEALTH

VOLUME: 3 ISSUE: 2 - FEBRUARY, 2022



How to cite this article: Gonzalez D, Fortuna F, Ibar C, Jacobsen D, Jamardo J, Duarte E, Iglesias S, Gelos DS, Mesch V, Zopatti D, Berg G, Azzara S, Fabre DB. A Moderated Mediation Analysis between Burnout Components and Hair Cortisol. J Biomed Res Environ Sci. 2022 Feb 05; 3(2): 146-148. doi: 10.37871/jbres1412, Article ID: JBRES1412, Available at: <https://www.jelsciences.com/articles/jbres1412.pdf>

studied and it has a direct negative impact on anxiety, depression, and poor patient quality care, among others [5]. This phenomenon is related to a Hypothalamic-Pituitary-Adrenal (HPA) axis deregulation which leads to an altered cortisol release. Recently, hair cortisol evaluation emerged as a suitable biomarker for adrenal axis evaluation, reflecting an individual's exposure to chronic stressful events.

In a previous study, our group evaluated stress, burnout and hair cortisol in 234 health workers (68 men (39.6 ± 10 years) and 166 women (41 ± 12 years)) at "Hospital de Clínicas José de San Martín" in the context of COVID-19 pandemic [6]. As a sequel of that study, in this opportunity our aim was to study the possible effects of third variables in the relationship between psychological and biological variables in this population. Participants were recruited through department heads and via e-mail. Individuals under treatment with glucocorticoids, psychotropic drugs, with HPA axis alterations or a previous diagnosis of mental health disorders were excluded. Additionally, individuals with less than 3 cm hair length on the posterior vertex were also excluded. This study used a transversal observational design. The participants did not receive any kind of compensation for participating in the study and all of them gave written prior informed consent. The study was approved in advance by the Ethics Committee of the Hospital and was performed following the Helsinki Declaration for medical studies in humans.

Hair sample collection and hair cortisol measurement were performed according to Gonzalez, et al. [7]. All participants completed the following surveys: perceived stress [8] and burnout scale [9]. Perceived stress survey consists in 4 items, answered on a 5-point Likert scale ranging from "never" to "very often". A median score value of 6 was used for the results analysis. The psychological tools' reliability analysis showed a Cronbach's alpha of 0.708 for perceived stress survey and 0.805 for burnout survey. The multidimensional concept of burnout was measured by Maslach Burnout Inventory-Human Services Survey (MBI -

HSS). This scale consists of 22 items distributed into three subscales: Emotional Exhaustion (EE) scoring from 0 to 54, Depersonalization (DP) scoring from 0 to 30 and Personal Accomplishment (PA) scoring from 0 to 48. Item responses are from 0 (never) to 6 (every day), burnout definition requires the presence of the three components: High EE (score > 26), high DP (score > 9) and low PA (score < 34). Mediation analysis was performed using Hayes PROCESS macro in SPSS statistical software. All analyses were conducted with SPSS 19.0 statistical software.

Our results showed that 40% of volunteers presented altered hair cortisol values, while burnout was found in 12% of the study population. Considering each component at once, 33% of the studied population showed high depersonalization, 38% high emotional fatigue, 36% low personal fulfillment and 22% presented 2 of the 3 burnout components. When a third-variables analysis was performed, we found a moderated mediation between psychological and biological variables. On one side, DP mediated the relationship between self-perceived stress and hair cortisol concentration (Indirect effect: $\beta = 0.69$, SE = 0.42, IC: 0.0987-1.8840), and on the other side, a moderating effect of PA ($\beta = -0.203$, $p = 0.001$; IC: -0,3237--0,0829) and EE ($\beta = -0.124$, $p = 0.032$; IC: 0,0107-0,2371) was also observed between DP and hair cortisol concentration as shown in figure 1.

In individuals with low PA (score < 24), a direct and significant association was observed between DP and hair cortisol levels ($p = 0.0002$). Moreover, according to a posteriori significance region Johnson-Neyman analysis, personal accomplishment became a moderator in this relationship under 33.2 (Effect: 1.7664, $p < 0.05$). On the other hand, in individuals with higher EE (score > 35), a direct and significant association was observed between DP and hair cortisol levels ($p = 0.0058$) and a posteriori significance region Johnson-Neyman analysis showed that EE became a moderator variable value over 26.8 (Effect: 1.4827, $p < 0.05$).

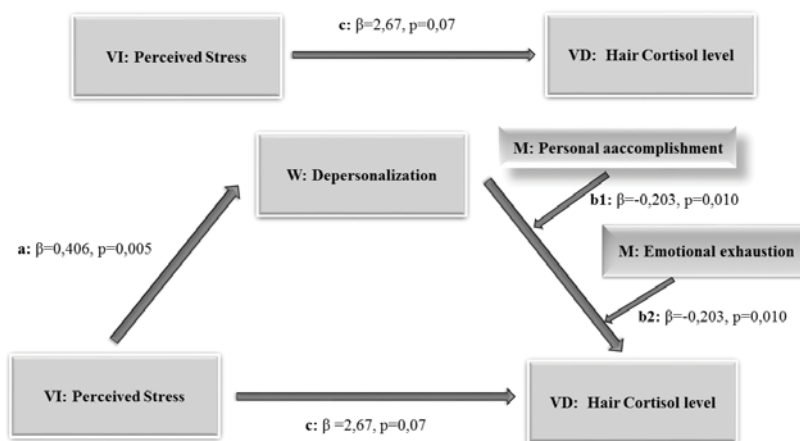


Figure 1 Moderated mediation.

Emotional exhaustion is a chronic state of fatigue or psychological tension that results from frequent exposure to occupational stressors and it is associated with anxiety, psychosomatic complaints and depression. It has a strong tendency to alter the way an individual reacts to certain environmental demands. According to Halbesleben and Bowler [10], when someone is emotionally exhausted, it is more likely that his/her work performance will be affected as well as their ability to cope with stress. Proactive individuals tend to develop better coping strategies in order to deal with burnout episodes. Consequently, high levels of EE would be most unfavorable when individuals are less proactive. This is consistent with our findings since DP is a mediating variable between perceived stress and hair cortisol concentration. Several studies have shown that in subjects who do not have a proactive personality, DP acts as a dysfunctional coping strategy [11]. People with high DP need to acquire and use even more task-oriented strategies for compensate their emotional tendencies, in order to develop a more proactive personality. In this study, it has been demonstrated that EE moderates the relationship between dysfunctional personality (high DP) and individual reactivity to stress. As this moderation effect takes place only in high values of EE, it would be useful to employ appropriate intervention strategies to reduce it so as to eliminate harmful moderation effects, improving mental health and life quality.

As it was formerly mentioned, low PA was found to be another moderating variable. The need for achievement was defined by Pang [12] as a "preference for effectively rewarding experiences related to improving one's performance" and it has been associated with several issues, such as academic performance, academic stress and labor stress [13].

Schultheiss, et al. [14] examined achievement motivation effects on cortisol reactivity after proficiency competition. They found that achievement motivation dampened cortisol response only after challenging tasks but not in a non-challenging control condition. Therefore, their findings suggest that achievement motivation can help moderate cortisol response in challenging but reinforcing personal performance contexts. This is consistent with our results since the detrimental moderating effect of PA dimension occurs only for low values of this Burnout's subscale. Considering the concept of motivational achievement, pandemic context did not offer affectively rewarding experiences related to improving personal performance, maintaining a low sense of achievement. It would be helpful to implement modifications that seek to reduce insecurity, uncertainty and discouraging aspects caused by the pandemic. This would help to reduce health workers demotivation and hopelessness with the consequent increase of PA to protective values, contributing to the elimination of the harmful moderating effect found.

In conclusion, our research highlights the importance of including a biological variable such as hair cortisol in burnout assessment.

DECLARATION OF INTEREST

The authors declare that there is no conflict of interest that could be perceived as prejudicing the impartiality of this brief report.

FUNDING

This work was supported by UBACyT (grant number 20020190200273BA).

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