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Abstract

Workers in the prison system experience stress at high levels in their daily lives, so they become prone to the development of the Burnout Syndrome. In order to evaluate the occupational stress, the most sensitive and of easy access biochemical method is salivary cortisol. Aim: to evaluate the concentration of salivary cortisol in prison workers and to relate it to the Burnout Syndrome. Methodology: a cross-sectional and analytical study with 240 prison workers from the 3rd Penitentiary Region of the State of Rio Grande do Sul in Brazil, covering 8 counties and 10 prison houses. The instruments of data collection used were a sociodemographic characterization form, the Maslach Burnout Inventory and some salivary samples. The data collection period was from April to June 2017. Results: It was observed an increase in the dimensions of burnout concomitant with the increase of salivary cortisol levels in the research participants. Conclusion: The population studied experienced occupational stress evidenced by the use of the burnout and salivary cortisol instrument analysis, which is an important physiological indicator.

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ABSTRACT

*Workers in the prison system experience stress at high levels in their daily lives, so they become prone to the development of the Burnout Syndrome. In order to evaluate the occupational stress, the most sensitive and of easy access biochemical method is salivary cortisol. **Aim:** to evaluate the concentration of salivary cortisol in prison workers and to relate it to the Burnout Syndrome. **Methodology:** a cross-sectional and analytical study with 240 prison workers from the 3rd Penitentiary Region of the State of Rio Grande do Sul in Brazil, covering 8 counties and 10 prison houses. The instruments of data collection used were a sociodemographic characterization form, the Maslach Burnout Inventory and some salivary samples. The data collection period was from April to June 2017. **Results:** It was observed an increase in the dimensions of burnout concomitant with the increase of salivary cortisol levels in the research participants. **Conclusion:** The population studied experienced occupational stress evidenced by the use of the burnout and salivary cortisol instrument analysis, which is an important physiological indicator.*

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INTRODUCTION

Prison has a double function, that is, to be an instrument of punishment and to have the duty of modifying attitudes of People Deprived of Liberty (PDL) with the aim of reintegrating them into society and preventing the recidivism (MOLLEDA et al., 2015). These are the penitentiary servers roles, especially of the Penitentiary Agents, who are responsible for the safety of the inmates and the facilities (FINNEY et al., 2013). Due to the nature of their profession, they are exposed to several risks factors such as tensions and physical and mental exhaustion (FAGUNDES, COSTA and MOREIRA, 2017).

Workers in the prison system work in one of the areas more likely to the develop physical and mental health problems (MOLLEDA et al., 2015). These workers experience higher rates of occupational stress and of the Burnout Syndrome (SB) which result from organizational stressors and lead to negative results not only for them, but also for the institution (FINNEY et al., 2013). The authors point out that the structure and organizational environment are significantly associated to the occupational stress and SB.

In this sense, it is important to measure the cortisol dosage, insofar as it represents the physiological response of the organism to the stressors of the environment. Thus, to evaluate the stress, the cortisol dosage constitutes the most known and sensitive biochemical method (GUNNAR; QUEVEDO, 2007). It has an important role in research on worker's health because of its potential use to evaluate the physiological response in work groups exposed to overload and occupational stress (CAMPOS & DAVID, 2014).

The responsible for producing and releasing cortisol is the cortex of the adrenal glands, in the last stages of sleep, in order to prepare the organism for wakefulness. The concentration of cortisol on the awakening period is higher and decreases, gradually throughout the day reaching lower concentrations before the individual sleeps (NUNES, 2008). It is a hormone activated in the second moment of the reaction to stress, in the negative feedback to the brain, that regulates the restoration of neurophysiological functioning (McEWEN, 2000). Because it has receptors on basically all organs and directly affects the functioning of the Hypothalamic-Pituitary-adrenal axis, it alters systemic autonomic and immune-system functions (HELLHAMMER; WUST; KUDIELKA, 2009; LUPIEN et al., 2007).

Nowadays, in the stress research, salivary cortisol is the most frequently evaluated hormone, due to the ease of access (CHRIST-CRAIN et al., 2007). Other authors have confirmed that the determination of salivary cortisol is the most appropriate for the detection of excessive concentration of the hormone in the organism, due to the ease of obtaining the sample and for not requiring invasive procedures of high cost and complexity (HELLHAMMER; WUST; KUDIELKA, 2009). Its correlation with plasma cortisol is about 90% of compatibility, which demonstrates the level of diagnostic sensitivity and favors scientific investigations (Rosal et al., 2004, TAYLOR et al., 2007).

These considerations reaffirm the importance of expanding studies that relate cortisol levels to burnout. It is a current and relevant theme and requires preventive actions to avoid damages to the physical and mental health of prison workers who experience stress in their daily work. In this context, the question made is: what level of concentration of salivary cortisol is related to the burnout syndrome in workers who work in the 3rd Penitentiary Region of the State of Rio Grande do Sul? The present study aims to evaluate the concentration of salivary cortisol in prison workers and to relate it to Burnout Syndrome.

METHODOLOGY

This study integrates the master's dissertation "Stress, burnout syndrome and salivary cortisol in penitentiary servers". This is a cross-sectional and analytical study. The participant workers had to meet the following inclusion criteria: to be a penitentiary worker and active laborer; to be a member of the Superintendency of Penitentiary Services (SUSEPE) belonging to the 3rd Penitentiary Region and to voluntarily participate in the research. Servers with difficulty to understand the issues that integrated the data collection instruments and workers who went through an invasive dental procedure due to gingival bleedings were excluded.

The target population consisted of 381 prison workers assigned to the 3rd Penitentiary Region of the State of Rio Grande do Sul in Brazil which is composed of eight counties and ten prison houses that belong to the following professional categories: Penitentiary Agents, Administrative Penitentiary Agents and Penitentiary Superior Technicians. In the data collection period, from April to June 2017, 88 servers

were not found in prisons, 11 were granted absence leave, nine were dismissed for health reasons, seven were on leave, five refused to participate, three were removed by the Prosecutor's Office General of the State, one was assigned to the union and one was on maternity leave. Thus, 254 workers participated effectively in the study.

The data was collected through the use of a protocol composed of a sociodemographic and occupational characterization form, the *Maslach Burnout Inventory (MIB)* and salivary samples. The form was elaborated by the researcher and included the following variables: sex, marital status, educational background, position, time of activity in SUSEPE, occupational class, place of residence, working hours load, option to act in the prison system. For the question concerning the reasons that led the worker to choose to be a penitentiary server, it was allowed the use of multiple answers.

The MBI assesses the *burnout* in relation to the personal feelings and attitudes of the professional in their work and in front of the others. The choice of the cut-off points in the MBI scores was performed by the 75th percentile, the same used in the validation study of MBI in Brazil (LAUTERT, 1995). In this way, each dimension was categorized in low / moderate or high level. For the analysis, the following three dimensions of burnout were used: For the Emotional Wear dimension considering the 75th percentile was found: Low / moderate level - score from 0 to 17; High level - score from 18 to 34; In the Depersonalization, dimension considering the 75th percentile, it was found: Low / moderate level - score from 0 to 9; High level - score from 10 to 17. In the Professional Incompetence dimension considering the 25th percentile, this one with a reverse score, it was found: Low / moderate level - score from 17 to 32; high level - score from 0 to 16.

To evaluate salivary cortisol levels, participants' salivary samples were collected by means of Salivette® tubes, properly identified and stored under appropriate conditions and location. The saliva collections were done by the worker himself, on cotton rollers of high absorption present in the Salivette® tube. There was no need for fasting; when the examination was performed after the main meals, there was a three-hour interval between meal and collection. Before collection, three hours without brushing the teeth were needed.

Collection procedure: The Salivette® was opened and the swab was removed and placed in the mouth to stimulate salivation. It was maintained for three to five minutes or the time needed to feel it was saturated with saliva; afterwards, it returned to the initial position in the Salivette® and the tube was tightly closed. The minimum volume of saliva required was 1.0 mL. After collection, the samples were kept under refrigeration (2-8°C) and sent to laboratory analysis. The samples were processed in the Clinical Analyzes Laboratory and the cortisol was determined by the method of Electrochemiluminescence. The cortisol reference values were the following: Morning collection - 10h: <0.78 ug / dL; Afternoon collection: <0.24 µg / dL; Night collection: <0.24 µg / dL. The research data was recorded and organized in the Statistical Package for Social Science (SPSS), version 15.0. Descriptive statistics (upper and lower limit, mean, standard deviation, coefficient of variation), ANOVA, Student t and 95% confidence interval were used.

All the ethical aspects that rule research with human beings have been respected. The project, was approved by the Research Ethics Committee of UNIJUÍ (opinion n° 1.948.910, CAAE n° 63136916.6.0000.5350) after the consent of the Ethics Committee of the Penitentiary School of the State

of Rio Grande do Sul in Brazil. Participants who agreed to join the survey signed a Free and Informed Consent Form in two copies.

RESULTS

Table 1 shows the reference values of the salivary cortisol analysis in prison workers during the morning or afternoon work shift. Among the participants, it was found that the majority had cortisol levels within the reference parameters, but 2.4% had elevated levels of salivary cortisol.

Table 1 - Salivary Cortisol analysis of penitentiary workers. 3rd Penitentiary Region of the State of Rio Grande do Sul. April to June / 2017.

Shift	Reference values	n	%
Morning	$\leq 0,78$ g/Dl	199	78,3
	$> 0,78$ ug/dL	5	2,0
Afternoon	$\leq 0,24$ g/Dl	35	13,8
	$> 0,24$ ug/Dl	1	0,4

*14(5,5%) unsatisfactory samples for cortisol analysis.

Table 2 shows the dimensions of the MBI in which it is verified that 22.8% of the workers were found in a high level of *burnout* in the three dimensions; 10.05% of them presented a high level of burnout in the following two dimensions, Depersonalization and Professional Incompetence; 3% in Professional Incompetence and Emotional Wear and 40.4% in Emotional Wear and Depersonalization dimensions. The workers who had a high level of *burnout* in only one of the dimensions represented 26.3% in Depersonalization; 21.8% in Professional Incompetence and 9.1% in Emotional Wear. It was also verified that 66% of them were in low or moderate level of *burnout* in all dimensions of the Syndrome.

Table 2 - MBI analysis in the three dimensions of the SB of prison workers. 3rd Penitentiary Region of RS. April to June / 2017

Depersonalization			Emotional distress	
			High level	Low / moderate level
High level	Professional Incompetence	High level	13	6
		Low / moderate level	22,8% 23 40,4%	10,5% 15 26,3%
Low / moderate level	Professional Incompetence	High level	6	43
		Low / moderate level	3,0% 18 9,1%	21,8% 130 66,0%

Table 3 presents results of the use of descriptive statistics, Student t and ANOVA of the value of cortisol levels according to MBI. It was observed that in the general evaluation of the participants cortisol levels were higher and statistically significant, in participants who presented a high level of SB.

Table 3 - Descriptive statistics, Student t and ANOVA of the cortisol value according to SB levels of workers who work in the 3rd Penitentiary Region of the State of Rio Grande do Sul from April to June / 2017.

	LI	UI	Average	Standard deviation	CV%	p-value
MBI						Teste t
High level	0,079	0,990	0,311	0,207	66,56	0,028
Low / moderate level	0,060	0,915	0,244	0,175	71,43	

The averages differed for p <0.05; LI = Lower limit; UI = Upper limit; 14 unsatisfactory samples.

DISCUSSION

The routes through which occupational stress produces adverse health effects is a challenge (Campos, Davis, 2014). It can bring consequences for the workers and the institutions, such as significant costs to the organization, due to absenteeism, lower productivity and health treatments (AKBARI et al., 2014). Occupational stress can cause damage to physical and mental health (SHAKERIAN et al., 2017). Among the occupational stressors are work overload and lack of freedom of decision (AKBARI et al., 2014). The authors point out that the workload of the Correctional Agents has increased in recent years due to financial and staff cuts and prison population growth. Consequently, they needed to increase the workload and stay longer in the work environment. To cope with stress, they often resort to harmful habits such as increased alcohol intake, smoking and substance abuse.

SB is an occupational disease due to physical and psychological exhaustion, together with permanent stress at work (CORRÊA et al., 2017). The authors point out that burnout occurs mainly in those professions that have direct contact with people, such as nurses, police officers, penitentiary agents and teachers. It includes the following three dimensions: Emotional Exhaustion, Depersonalization and Professional Incompetence (MASLACH, LEITER, 2016). It is associated with unknown physiological changes of the hypothalamic-pituitary-adrenal axis and, consequently, the deregulation of the cortisol hormone (RIBEIRO; MOTTA, 2014).

Today, salivary cortisol plays a key role in workers' health research because of its potential use to evaluate the physiological response in work groups exposed to overload and occupational stress (CAMPOS, DAVID, 2014). It is the most promising marker to evaluate the response to neurobiological stress (KUDIŁKA et al., 2012). Despite several studies on stress and cortisol published in recent decades, surprisingly, few studies have examined changes in cortisol levels in relation to burnout (PENZ et al., 2017).

The results of this research allow us to state that, the higher the burnout the higher the level of cortisol in the workers participating in the research. A study by Marchand et al. (2014) comes to meet this result. They assessed symptoms of burnout and salivary cortisol levels in 401 Canadian workers who work on day shift. The authors found that women were 56.1% of the workers with a mean age of 41.3 years. Emotional Exhaustion was more correlated with cortisol concentrations at dawn and at bedtime. Professional Incompetence only manifested itself at bedtime, while the dimension of depersonalization was not relevant. Burnout was characterized by a marked decline in the lowest concentrations of cortisol, 30 minutes after awakening, and the higher the burnout the lower cortisol levels found. Cohort Study, Penz et al. (2017) with 314 participants in Dresden, Germany showed associations between concentrations of hair cortisol and burnout. They found elevated levels of cortisol in individuals who reported various symptoms of burnout.

The results of the present study here analyzed show the relationship between SB and levels of salivary cortisol, which are in agreement with other international investigations. This shows the research gap that surrounds this theme allied to the use of a physiological indicator of stress.

CONCLUSION

The SB is present in the workers participating in the research, in all dimensions that integrate the instrument used, and salivary cortisol levels were also elevated. From these results, it can be stated that this population who experiences occupational stress, tends to become ill and that the evaluation of salivary cortisol is an important physiological indicator which can be used to evaluate these professionals.

These results can be used by managers, workers and researchers to expand SB knowledge and to instigate the development of more research on the subject and, in this way, to obtain more scientific evidence to prevent physical and mental health problems, with repercussions on the work quality with people deprived of their freedom, on the image of the prison system and on society as a whole.

REFERENCES

AKBARI, Jafar et al. Job Stress among Iranian Prison Employees. **The International Journal Of Occupational And Environmental Medicine**, v. 5, p.208-215, jan. 2014.

CAMPOS, Juliana Faria; DAVID, Helena Maria Scherlowski Leal. Analysis of salivary cortisol as a biomarker of occupational stress in nursing workers. *Nursing Magazine Uerj*, [s. L.], v. 4, n. 22, p.447-453, 2014.

CORRÊA, Jonathan Saidelles et al. Characteristics of national publications on Burnout Syndrome. *Human Knowledge: Scientific Journal of the Faculty Antonio Meneghetti*, [s.l.], v. 7, n. 10, p.91-104, 9 ago. 2017. Available in: <https://saberhumano.emnuvens.com.br/sh/article/view/212>. Access in: 13 de nov. de 2017.

CHRIST-CRAIN, M. et al. Measurement of serum free cortisol shows discordant responsivity to stress and dynamic evaluation. **The Journal of Clinical Endocrinology & Metabolism**, p. 1729-1735, 2007. Available in: http://www.researchgate.net/publication/6464379_Measurement_of_Serum_Free_Cortisol_Shows_Discordant_Responsivity_to_Stress_and_Dynamic_Evaluation>. Access in: 14 de junho de 2017.

FAGUNDES, Emerson de França; COSTA, Guilherme Carlos da; MOREIRA, Tabita Aija Silva.

Quality of Life at Work the case of penitentiary agents at a Provisional Detention Center in Rio Grande do Norte.. **Research, Society And Development**, [s. I.], v. 5, n. 2, p.109-123, 2017. Available in: <https://rsd.unifei.edu.br/index.php/rsd/article/view/101>>. Access in: 05 de set. de 2017.

FINNEY, Caitlin et al. Organizational stressors associated with job stress and burnout in correctional officers: a systematic review. **Bmc Public Health**, [s.l.], v. 13, n. 1, p.1-13, 29 jan. 2013. Springer Nature. Available in: <https://bmcpublikealth.biomedcentral.com/track/pdf/10.1186/1471-2458-13-82?site=bmcpublikealth.biomedcentral.com> >. Access in: 05 de out. de 2017.

GUNNAR, M.; QUEVEDO, K. The neurobiology of stress and development. **Annual Review of Psychology**, p. 145-73, 2007. Available in: <http://www.annualreviews.org/doi/pdf/10.1146/annurev.psych.58.110405.085605>> Access in: 14 de jun. de 2017.

HELLHAMMER, DH; WÜST S; KUDIELKA BM. Salivary cortisol a biomarker in stress research. **Psychoneuroendocrinology**, p.163-71, 2009.

KALRA, S. et al. The relationship between stress and hair cortisol in healthy pregnant women. **Clinical and Investigative Medicine**, p. 103-107, 2007. Available in:

<<file:///D:/Meus%20Documentos/Downloads/986-3179-1-PB.pdf>> Access in: 10 de agosto de 2017.

LAUTERT, Liana. The professional wear of the nurse. 1995. 275 f. Thesis (Doctorate) - Psychology Course, Universidad Pontificia de Salamanca, Spain, 1995. Available in: <

<http://www.lume.ufrgs.br/handle/10183/11028>>. Access in: 02 de jun. de 2017.

LUPIEN, S. J. et al. The effects of stress and stress hormones on human cognition: implications for the field of brain and cognition. **Brain and Cognition**, p. 209-237, 2007. Available in:

<<http://www.ncbi.nlm.nih.gov/pubmed/17466428>> Access in: 10 de agosto de 2016.

MARCHAND, Alain et al. Burnout symptom sub-types and cortisol profiles: What's burning most?. **Psychoneuroendocrinology**, [s.l.], v. 40, p.27-36, fev. 2014.

MASLACH, Christina; LEITER, Michael P.. Understanding the burnout experience: recent research and its implications for psychiatry. **World Psychiatry**, [s.l.], v. 15, n. 2, p. 103-111, jun. 2016. Available in:

< <https://www.ncbi.nlm.nih.gov/pubmed/27265691>>. Access in: 10 ago. 2017.

McEWEN, B. S. Allostasis and allostatic load: implications for neuropsychopharmacology.

Neuropsychopharmacology, 22:108-123, 2000. Available in:

<<http://www.nature.com/npp/journal/v22/n2/pdf/1395453a.pdf>> Access in: 10 de agosto de 2017.

MOLLEDA et al. Influence of burnout on the health of prison workers. Revista Española de Sanidad Penitenciaria, p.: 67-73, 2015.

NUNES, M.T. The endocrine hypothalamus. Physiology. 3. ed. Rio de Janeiro: Guanabara Koogan; 2008. p. 930-51.

PENZ, Marlene et al. Hair cortisol as a biological marker for burnout

symptomatology. **Psychoneuroendocrinology**, [s.l.], p.1-3, jul. 2017. Elsevier BV. Available in: <

<http://dx.doi.org/10.1016/j.psyneuen.2017.07.485>>. Access in: 10 de outubro de 2017.

RIBEIRO, Samara dos Santos; MOTTA, Elizângela Araujo Pestana. ASSOCIATION BETWEEN BURNOUT SYNDROME AND CORTISOL HORMONE. Journal of Health Sciences, [s. L.], v. 16, n. 2, p.87-93, 2014. Semestral. Access in:

<http://www.periodicoeletronicos.ufma.br/index.php/rcisaude/article/view/4081>

ROSAL, M. C. et al. Stress, social support, and cortisol: inverse associations? **Behavioral Medicine**, 30:11-21, 2004. Available in: <<http://www.ncbi.nlm.nih.gov/pubmed/15473629>> Access in: 15 de agosto de 2016.

SHAKERIAN, Mahnaz et al. Job demand-control and job stress at work: A cross-sectional study among prison staff. **Journal Of Education And Health Promotion**, [s.l.], v. 6, n. 1, p.15-25, 2017.

SILVA, Jonatan da Rosa Pereira da et al. Human Cost in the Work of Penitentiary Agents. *Brazilian Journal of Scientific Initiation*, Itapetininga, v. 3, n. 6, p.112-124, 2016.

SIMPSON, E. E. A. et al. Salivary cortisol, stress, and mood in healthy older adults: the Zenith study. **Biological Psychology**, 78:1-9, 2008. Available in: <<http://www.ncbi.nlm.nih.gov/pubmed/18243482>> Access in: 10 de agosto de 2017.

SOARES, A. J. A.; ALVES, M. G. P. Cortisol as a variable in health psychology. *Psychology, Health & Diseases*, 7:165-177, 2006. Available in: <<file:///D:/Meus%20Documentos/Downloads/105.pdf>> Access in: 15 de julho de 2017

TAYLOR, S. E. et al. Cultural differences in the impact of social support on psychological and biological stress responses. **Psychological Science**, p. 831-837, 2007. Available in: <<http://www.ncbi.nlm.nih.gov/pubmed/17760781>> Access in: 15 de julho de 2017.