Psychoneuroendocrinology 77 (2017) 47–50

Contents lists available at ScienceDirect

Psychoneuroendocrinology

journal homepage: www.elsevier.com/locate/psyneuen

Short Communication

Female nurses' burnout symptoms: No association with the Hypothalamic-pituitary-thyroid (HPT) axis

Yufang Guo[a], Louisa Lam[b], Yuanhui Luo[a], Virginia Plummer[b,c], Wendy Cross[b], Hui Li[a], Yizhen Yin[a], Jingping Zhang[a,*]

[a] Nursing Psychology Research Center of Xiangya Nursing School, Central South University, Changsha, 410013, Hunan, China
[b] School of Nursing and Midwifery, Faculty of Medicine, Nursing and Health Sciences, Monash University, 3800, Melbourne Victoria, Australia
[c] Peninsula Health, Hastings Road Frankston, Australia

ARTICLE INFO

Article history:
Received 19 September 2016
Received in revised form 1 November 2016
Accepted 16 November 2016

Keywords:
Burnout
Cynicism
Emotional exhaustion
Hypothalamic-pituitary-thyroid
Reduced professional efficacy
Stress

ABSTRACT

Across the world, hospital nurses experience a high level of burnout. Exploring biochemical markers of burnout could help to understand physiological changes and may provide useful evidence for preventing burnout symptoms. The current study included 94 female nurses from one Chinese third-level hospital. The Maslach Burnout Inventory-General Survey (MBI-GS) was used to investigate burnout symptoms: emotional exhaustion, cynicism, reduced professional efficacy, as well as the burnout average. The HPT axis was tested by checking blood levels of thyroid-stimulating hormone (TSH), thyroxin (T_4) and triiodothyronine (T_3). Nonparametric tests showed that no significant difference in biochemical markers was found between the burnout and non-burnout groups. Spearman correlation analysis found that biochemical markers had no significant association with burnout symptoms, except weakly negative associations between reduced professional efficacy and blood pressure and heart rate. These findings show a rather poor correlation of the HPT axis on burnout symptoms. Expanding the biochemical index of the HPT axis, comparing well-defined samples and using longitudinal studies are recommended for further studies.

1. Introduction

Burnout has been defined as a negative psychological condition involving emotional exhaustion, cynicism and reduced professional efficacy which is caused by chronic work-related stress, and is often found in jobs with frequent social interactions such as health care workers and human service providers. Studies show that 13%–27% of the general working population in western countries experienced burnout symptoms, while among the health and human service workers, the rate ranged from 20% to 50%. Laschinger et al. (2009) reported that 47.3% of staff nurses presented a high level of burnout and Zhou et al. (2015) reported that up to 35.5% of nurses had severe burnout symptoms. Given that burnout is a major work-related psychological problem among nursing groups, investigating its state and association with biochemical markers are of particular interest.

Hypothalamic-Pituitary-Thyroid (HPT) axis is a central regulatory system connecting the brain with thyrotropin-releasing hormone, thyroid-stimulating hormone (TSH), thyroxin (T_4) and triiodothyronine (T_3). Studies on the physiological effects of stress reported that HPT axis was correlated with stress-related disorders. Asberg et al. (2009) investigated the biochemical markers of prolonged psychosocial stress and found that there were significant differences in T_3 and TSH among participants from sick leave groups, occupational stress groups and healthy groups. Harbeck et al. (2015) found that TSH was an early and sensitive biochemical predictor of chronic stress with a significant increase in stress events. Loo et al. (2013) showed that the serum T_3 and T_4 levels were elevated in breast cancer patients with long-term Post-Traumatic Stress Disorder (PTSD) (Table 1).

According to the psychological stress system (Jiang, 1993), job stress is considered as a stressor, which could lead to individuals' psychological and physical changes. In this study, burnout symptoms are stress-related psychological changes, and HPT axis' hormones are stress-related physical changes. We hypothesise that the burnout nurses group had lower levels of T3 and T4 and a higher level of TSH. In addition, the association between burnout symp-

* Corresponding at: Nursing Psychology Research Center of Xiangya Nursing School, Central South University, 172 Tong Zi Po Road, Changsha 410013, Hunan, China.
E-mail address: jpzhang1965@163.com (J. Zhang).

http://dx.doi.org/10.1016/j.psyneuen.2016.11.020
0306-4530/

toms and BMI, blood pressure, blood glucose and heart rate were also tested.

2. Methods

2.1. Participants

A convenience sample of nurses was recruited from one Chinese third-level hospital. Head Nurses and the Director of the hospital gave permission to recruit nurses. After the study information session, nurses who were interested in participating contacted researchers. Participation was voluntary and anonymous. Ninety-six nurses (94 female, 2 male) from eight different departments participated in this study. Considering the small number of male nurses included in this study, the representation of male nurses was not significant. Thus, 94 female nurses were selected for further analysis. Exclusion criteria were participants who were taking any medication that affected the HPT axis' function and participants who were taking oestrogens, pregnant or postmenopausal. Data was collected from April to June 2015. Ethical approval was provided by the Institutional Review Boards (IRB) of Xiangya Nursing School, Central South University. The objects and procedures were explained to the participants. Informed consent was signed by the participants before the study began (Table 2).

2.2. Data collection

2.2.1. Blood sampling and thyroid hormones determination

Detailed instructions about blood collection were given. The blood samples were collected on a day during the third to the tenth day of the menstrual cycle in order to avoid confounding effects of sex hormones. Participants were instructed not to eat or drink anything other than water, and not to undertake any strenuous exercise 2 h or smoking 30 min before a blood sample was taken. Five trained researchers drew the blood samples between 7am-9am at an experimental lab. As nurses were very busy during the working days, they were instructed to take a blood sample at that period of their convenient days.

Blood was collected using vacuum blood collection tubes (Hubei Jin Xing Technology Co. Wuhan) and sent to an endocrinology laboratory for biochemical analysis at no cost to the participants (Endocrinology Laboratory, The Second Xiangya Hospital of Central South University, Dr. Z.X. Gui). Blood samples were centrifuged at 4000 rpm for 2 min in order to get a clear supernatant. Blood thyroid hormones, including bound T_3, T_4 and serum TSH, were measured using an immunoassay with chemiluminescence detection (ADVIA Centaur® XP Immunoassay System, Siemens, Germany).

2.2.2. Other biomarkers

Height and weight were measured to calculate the BMI of participants. Heart rate and blood pressure were measured in the sitting position on the right arm. Infrared pulse sensor (HKG-07, Hefei Huake Information Technology Co. Ltd, China) was used to measure heart rate. Sphygmomanometers were used to measure blood pressure. All of these biomarkers were measured twice and the mean of two recordings was computed. The fasting blood glucose was measured using blood-glucose meters (Ultra Vue, Johnson, China).

2.2.3. The maslach burnout inventory– general survey (MBI-GS)

Prior to the blood samples collection, participants were instructed to take the MBI-GS. This scale, developed by Schaufeli et al. (1996), includes three metrics: Emotional Exhaustion (EE, five items), Cynicism (CY, five items) and Reduced Professional Efficacy (RPE, six items). A 7-point Likert scale from 0 (never) to 6 (everyday) was used to score each item. Based on the findings of Kalimo et al. (2003), a total score for burnout was computed to avoid the use of the three subscales separately (total score = $0.40 \times EE + 0.3 \times CY + 0.3 \times RPE$). The defined three groups include: (1) no burnout (scores 0–1.49); (2) some burnout symptoms (scores 1.50–3.49); (3) serious burnout (scores 3.50-6). The Cronbach alpha coefficients for EE, CY, RPE and the whole scale were 0.93, 0.83, 0.82 and 0.86, respectively.

2.3. Statistical analysis

SPSS 23.0 (Chicago, IL, USA) was used for data analysis. Demographic characteristics, questionnaire data and biomarkers were analysed using mean, standard deviations and percentage. Because of the small number of participants experiencing severe burnout, participants were divided into the non-burnout group and the burnout group. Because height, weight, BMI, blood pressure, blood glucose, T3, T4 and TSH showed non-normal distributions (checked by Kolmogorov-Smirnov test) before and after log transformation, nonparametric tests were performed to analyse the differences in biomarkers between the two groups. Spearman correlation analysis was used to analyse associations between biomarkers and burnout. For all tests, the level of significance was set at $P < 0.05$.

3. Results

3.1. Burnout and biochemical markers states

The mean scores of EE, CY and RPE were 1.91 (SD 1.00; 0.4–6.0), 1.67 (SD 1.03; 0.2–6.0) and 1.75 (SD 1.25; 0–5.0), respectively. The total burnout score was 1.79 (SD 0.82; 0.43–5.15), where 42 (44.7%) nurses had no burnout, 50 (53.2%) experienced some burnout symptoms and only two (2.1%) experienced severe burnout.

The average height and weight were 1.61 m (SD 0.04; 1.50–1.68 m) and 53.13 kg (SD 5.65; 42.0–69.0 kg). Nearly all nurses' T_3 (93, 98.9%, normal range: 0.7–2.70 nmol/L), T_4 (92, 97.9%, normal range: 58.1–164.8 nmol/L), heart rate (93, 98.9%, normal range: 60–100 beats per min) and systolic blood pressure (93, 98.9%, normal range: 90–140 mmHg) were in the normal range. Three (3.2%) nurses' TSH was lower than the normal range (0.55–4.78 mIU/L, adult) and four (4.3%) nurses' TSH was higher than the normal range. Eight (8.5%) nurses' diastolic blood pressure was lower than the normal range (60–90 mmHg). Eight (8.5%) nurses' blood glucose was higher than the normal range (3.9–6.1 mmol/L). 16 (17.0%) nurses' BMI was lower than the normal range (18.5–23.9 kg/m^2) and eight (8.5%) nurses' BMI was higher than the normal range.

3.2. Differential biochemical markers between groups

Mann-Whitney U Test showed that there was no significant differences in BMI, heart rate, systolic blood pressure, diastolic blood pressure, blood glucose, T_3, T_4 and TSH between the two groups ($P > 0.05$).

3.3. Continuous relationships between biochemical markers and burnout

Spearman correlation analysis showed that no significant association between biomarkers and burnout symptoms had been found ($P > 0.05$). There were weakly negative associations between RPE and diastolic blood pressure ($r = -0.211$, $P = 0.041$) and heart rate ($r = -0.220$, $P = 0.033$).