THE METABOLIC ROLE OF DEPRESSION AND BURNOUT IN NURSES

Betina Ferreira[1], Shamona Maharaj[1], Prof Ann Simpson[2], Dr Najah Nassif[2], A/Prof Sara Lal[1]

[1] Neuroscience Research Unit, School of Life Sciences, University of Technology Sydney, NSW, Australia

[2] School of Life Sciences, University of Technology Sydney, NSW, Australia

Abstract: The present study aimed to assess the associations between depression and burnout, and blood glucose levels and haemoglobin A1c in nurses and non-nurses, using psychometric and metabolic assessment. Nurses experienced a significantly higher level of burnout than non-nurses ($p<0.05$), as measured by the Emotional Exhaustion scale of the Maslach Burnout Inventory, as well as a significantly lower level of burnout than non-nurses as measured by the Personal Accomplishment subscale of the Maslach Burnout Inventory ($p<0.01$).

Keywords: Nursing, depression, burnout, blood glucose, haemoglobin A1c

1. Introduction

Being at the forefront of patient care, nurses spend more time with their patients than any other healthcare provider, and patient outcomes are directly affected by the quality of care provided by these professionals [1]. The work conditions of nurses, as well as disruptions to their circadian rhythms, high workloads, and lack of control on the job make them highly susceptible to developing psychological conditions such as depression, anxiety, stress, fatigue, and burnout [2,3].

Nurses may also be increasingly at risk of decreased physical health outcomes, such as the development of diabetes mellitus. In a longitudinal study of healthy Danish nurses, 4.4% were found to have developed type 2 diabetes mellitus (T2D) at the 15-year follow-up, with the nurses who worked night shifts significantly more at risk than those who worked only day shifts [4]. Furthermore, another large-scale longitudinal study found that nurses who developed T2D at the follow-up period did so at a younger age than non-nurses who developed the disease [5].

Nurses are twice as susceptible to depressive symptoms than the general population [6], with 32.4% of Australian nurses presenting with mild depression [7]. It has been reported that nurses are three times more likely to take sick leave than doctors working under the same conditions, with 1 in 4 nurses having taken mental health-related sick leave throughout their careers [8]. Nurses also suffer from great levels of occupational burnout, which is defined as chronic workplace stress that is not successfully managed [9]. Both depression and burnout have been associated with decreased cognitive performance and workplace performance in nurses [7, 10].

The high-stress and high-responsibility nature of health professions commonly leads to mismanaged mental health which not only directly affects patient outcomes [1] but may also affect the personal health and quality of life of nurses [11, 12]. Thus, this study aimed to investigate, in nurses compared to non-nurses, both the differences in psychometric and metabolic variables, and the relationship between psychometric and metabolic variables.

2. Materials and Methods

Recruitment for the study was undertaken using advertisements on social media and the placement of posters, as well as a snowballing technique where nurse participants indicated their colleagues or friends to participate.

In order to participate in the study, all participants had to demonstrate competency in the English language, as well as being unaffected by the exclusion criteria adapted from the Lifestyle Appraisal Questionnaire [13]. These exclusion criteria included: (i) systolic blood pressure (BP) of ≥ 160 mmHg, (ii) diastolic BP ≥ 100 mmHg, (iii) smoking > 10 cigarettes per day, (iv) consumption of > 10 standard drinks per day, (v) chronic health conditions, or (vi) daily medication use. Any potential subject who answered 'yes' to any of the aforementioned questions was excluded from the study according to Human Research Ethics Committee protocol. Furthermore, Prior to attending the study, participants were requested to abstain from food and drink consumption (with the exception of water), as well as nicotine, alcohol, and medications for ≥ 8 hours prior to participating.

Provided the inclusion criteria above were met, subjects were asked to sign the consent form. Three blood pressure measurements were obtained before and after the study. The Lifestyle Appraisal Questionnaire [13] was administered to collect demographic data, followed by the General Health Questionnaire [14] to assess psychological distress, the Depression, Anxiety and Stress Scale (DASS) [15] to assess depression, and the Maslach Burnout Inventory (MBI) [9] to assess burnout. The participants then undertook a finger prick procedure for blood glucose levels and haemoglobin A1c assessment.

In order to assess the differences in variables between the nurse and non-nurse samples, an independent sample t-test was performed. The associations between the psychometric and metabolic variables were analysed using Pearson's correlation analysis for the non-nurse group (n=36), and Spearman's correlation analysis for the nurse group (n=16). The effect size for the study was calculated as 0.7 using Cohen's power tables [16], a score which signifies a moderate-to-high effect size.

3. Results and Discussion

Both sample groups scored within the normal range for depression, with the nurses scoring slightly higher. As for burnout, the nurses scored significantly higher for Emotional Exhaustion of the MBI than the non-nurse group ($p=0.04$), with an average score indicating moderate severity of burnout. The nurse group scored in the moderate range and slightly higher than the non-nurse group in the Depersonalisation subscale of the MBI. As for Personal Accomplishment, the nurses presented significantly higher levels than the non-nurses ($p<0.01$), with a score indicating low severity of burnout for this measure. Table 1 displays the mean questionnaire scores for all psychometric measures administered, as well as the threshold for mild severity. Both the nurses and non-nurses had normal fasting blood glucose levels and haemoglobin A1c values, however, the nurses had slightly higher haemoglobin A1c levels than the non-nurses. No significant correlations were established between the psychometric variables and either blood glucose or haemoglobin A1c levels.

Table 1. Mean questionnaire scores for all psychometric measures administered. An independent sample t-test was used to compare means between the nurse and non-nurse groups. * Significant findings ($p < 0.05$) are highlighted in red.

Parameter	Mean ± Standard Deviation		p-value	Threshold (Mild)
	Nurses (n=16)	Non-nurses (n=36)		
GHQ	9.6 ± 10.6	6.6 ± 6.3	0.31	> 12
Depression	4.3 ± 5.8	3.8 ± 4.6	0.74	> 9
DASS Total	19.3 ± 18.6	16.1 ± 12.2	0.46	> 27
MBI EE	26.3 ± 12.2	18.1 ± 13.0	0.04*	> 16
MBI DP	7.9 ± 6.0	5.7 ± 6.0	0.22	> 6
MBI PA	40.8 ± 4.4	29.7 ± 9.0	<0.01*	< 39

Key: GHQ = General Health Questionnaire; DASS = Depression, Anxiety and Stress Scale; MBI = Maslach Burnout Inventory; EE = Emotional Exhaustion; DP = Depersonalisation; PA = Personal Accomplishment.

Nurses were found to experience significantly higher levels of emotional exhaustion than non-nurses ($p=0.04$), as well as significantly higher perceptions of personal accomplishments than non-nurses ($p<0.01$). While nurses scored slightly higher than non-nurses across all other psychometric variables, their understanding of the benefit of their work to society may have led to a decrease in burnout as measured by the Personal Accomplishment subscale of the MBI.

While nurses scored slightly higher than non-nurses in haemoglobin A1c, the differences in both metabolic variables between the two groups were non-significant. Furthermore, no significant correlations were found between any psychometric and metabolic variables in either sample group, perhaps indicating that the relationship between depression and burnout, and blood glucose levels and haemoglobin A1c may be due to external factors.

The study investigated the relationship between depression and burnout, and blood glucose levels (BGLs) and haemoglobin A1c (HbA1c) in a sample of 16 nurses and 36 non-nurses. While fasting BGLs were obtained in order to avoid possible discrepancies due to caloric intake, it should be noted that BGLs are highly variable and affected by several factors such as: dehydration, hormonal fluctuations, physical activity [17]. Therefore, the exploratory, cross-sectional study design may not be suitable to provide long-term information regarding risk factors for diabetes mellitus. Future studies should employ longitudinal experimental designs and utilise the follow-up period to better understand the effects of long-term mental disturbances on metabolic measures. Future comparative studies should compare the psychological and metabolic measures between different nurse types, as well as between other healthcare professions, in order to obtain additional information to advance upon the findings of the present study.

The variability of the data obtained in the study may have influenced the statistical significance of the findings. This may be addressed in future studies by eliminating all possible confounding variables in order to address outliers in the data, as well as increasing the sample size for both groups to ensure larger reliability of results. With a larger sample size and age- and Body Mass Index (BMI)-matched sample groups, the majority of the data should approach the mean, thereby increasing the statistical significance of the results.

It has been reported in the literature that BGLs and HbA1c values are positively correlated with age in individuals without a diagnosis of diabetes [18,19], creating a possible confounding factor in the present study. However, the mean age of the nurse sample was representative of the Australian nursing population [20]. Additionally, as reported by the Australian Bureau of Statistics, the risk of an individual

developing diabetes has been reported to remain constant until the age of 54 [21], indicating that both sample groups were below the age for which BGLs and HbA1c are expected to be significantly affected by age. Future research should eliminate age as a confounding factor by accounting for differences between sample groups in the statistical analysis stage, as well as age-matching sample groups to minimise the possibility of age affecting the data obtained.

Associations between work-related data and psychological and metabolic variables were not analysed due to the exploratory nature of this study. However, previous research has outlined the effects of occupational factors such as nurse type, shift work, and hours worked, on depression, burnout, and BGLs [4,6,10]. Addressing work-related factors that may impact metabolic measures would be beneficial in future studies.

The reliability of psychometric measures is widely reported in the literature using the Cronbach α score [22], or reliability coefficient. The General Health Questionnaire [14] had an α score of 0.86 [23], while the Depression subscale of the DASS [15] reported an α score of 0.94 [24], and the MBI [9] had α scores ranging from 0.74 to 0.89 for the three subscales used in the study [25]. These scores indicate that the questionnaires chosen for the study are suitable for use in clinical and research settings [26].

4. Conclusion

The present study established that nurses are significantly more susceptible to emotional exhaustion than non-nurses, as well as significantly more aware of their personal accomplishments than non-nurses. These findings highlight the need for further research on occupational burnout and how it affects individuals, as well as potentially suggesting a coping mechanism for nurses to manage their workplace stress.

Acknowledgements: To the Neuroscience Research Unit, School of Life Sciences, University of Technology Sydney for financial support.

References:

[1] DeLucia PR, Ott TE, Palmieri PA (2009) Performance in Nursing. Rev Hum Factors Ergon 5:1–40.

[2] Chang EM, Hancock KM, Johnson A, Daly J, Jackson D (2005) Role stress in nurses: Review of related factors and strategies for moving forward. Nurs Heal Sci 7:57–65.

[3] Nicoletti C, Müller C, Hayashi C, Nakaseko M, Tobita I, Läubli T (2015) Circadian rhythm of heart rate and physical activity in nurses during day and night shifts. Eur J Appl Physiol 115:1313–1320.

[4] Hansen AB, Stayner L, Hansen J, Andersen ZJ (2016) Night shift work and incidence of diabetes in the Danish Nurse Cohort. Occup Environ Med 73:262–268.

[5] Huang H-L, Pan C-C, Wang S-M, Kung P-T, Chou W-Y, Tsai W-C (2016) The incidence risk of type 2 diabetes mellitus in female nurses: a nationwide matched cohort study. BMC Public Health 16:443.

[6] Brandford AA, Reed DB (2016) Depression in Registered Nurses. Workplace Health and Safety 64:488–511.

[7] Maharaj S, Lees T, Lal S (2019) Prevalence and risk factors of depression, anxiety, and stress in a cohort of Australian nurses. Int J Environ Res Public Health 16.

[8] Jones-Berry S, Munn F (2017) Absence figures reveal extent of depression among nurses. Nurs Stand 32:7–8.

[9] Maslach C, Jackson SE (1981) The measurement of experienced burnout. J Organ Behav 2:99– 113.

[10] Letvak S, Ruhm CJ, McCoy T (2012) Depression in Hospital-Employed Nurses. Clin Nurse Spec 26:177–182.

[11] Melamed S, Shirom A, Toker S, Shapira I (2006) Burnout and Risk of Type 2 Diabetes: A Prospective Study of Apparently Healthy Employed Persons. Psychosom Med 68:863– 869.

[12] Hobfoll SE, Freedy J (2017) Conservation of Resources: A General Stress Theory Applied to Burnout. In: Professional Burnout, 1st ed. (Schaufeli W, Maslach C, Marek T, eds), pp 115–129. London: Routledge.

[13] Craig A, Hancock K, Craig M (1996) The lifestyle appraisal questionnaire: A comprehensive assessment of health and stress. Psychol Health 11:331–343.

[14] Goldberg D (1972) General Health Questionnaire (GHQ).

[15] Lovibond PF, Lovibond SH (1995) The structure of negative emotional states: Comparison of the Depression Anxiety Stress Scales (DASS) with the Beck Depression and Anxiety Inventories. Behav Res Ther 33:335–343.

[16] Cohen J (1988) Statistical Power Analysis for the Behavioral Sciences, 2nd ed. New York, NY: Lawrence Erlbaum Associates.

[17] American Diabetes Association (2018) Good to Know: Factors Affecting Blood Glucose. Clin Diabetes 36:202–202 Available at: http://clinical.diabetesjournals.org/lookup/doi/10.2337/cd18-0012.

[18] Pani LN, Korenda L, Meigs JB, Driver C, Chamany S, Fox CS, Sullivan L, D'Agostino RB, Nathan DM (2008) Effect of aging on A1C levels in individuals without diabetes: evidence from the Framingham Offspring Study and the National Health and Nutrition Examination Survey 2001-2004. Diabetes Care 31:1991–1996.

[19] Selvin E, Parrinello CM (2013) Age-related differences in glycaemic control in diabetes. Diabetologia 56:2549–2551.

[20] Australian Institute of Health and Welfare (2016) Nursing and midwifery workforce 2015. Canberra. Available at: https://www.aihw.gov.au/reports/workforce/nursing-and-midwifery-workforce-2015/contents/who-are-nurses-and-midwives.

[21] Australian Bureau of Statistics (2018) Diabetes Mellitus. Natl Heal Surv First Results, 2017-18 Available at: https://www.abs.gov.au/ausstats/abs@.nsf/Lookup/by Subject/4364.0.55.001~2017-18~Main Features~Diabetes mellitus~50.

[22] Cronbach LJ (1951) Coefficient alpha and the internal structure of tests. Psychometrika 16:297–334.

[23] Jackson C (2006) The General Health Questionnaire. Occup Med (Chic Ill) 57:79–79.

[24] Nieuwenhuijsen K, de Boer AGEM, Verbeek JHAM, Blonk RWB, van Dijk FJH (2003) The Depression Anxiety Stress Scales (DASS): detecting anxiety disorder and depression in employees absent from work because of mental health problems. Occup Environ Med 60 Suppl 1:77-82.

[25] Wheeler D, Vassar M, Worley J, Barnes L (2011) A Reliability generalization meta-analysis of coefficient Alpha for the Maslach Burnout Inventory. Educ Psychol Meas 71:231–244.

[26] Tavakol M, Dennick R (2011) Making sense of Cronbach's alpha. Int J Med Edu 2:53–55.