

ORIGINAL ARTICLE

Work Engagement and Work-related Musculoskeletal Disorders Among Nurses

Nur Azma Amin¹, RM Noah¹, Quek KF², Oxley JA³, Rusli BN⁴

¹ Universiti Kuala Lumpur Institute of Medical Science Technology, A1-1 Jalan TKS 1 Taman Kajang Sentral, 43000 Kajang Selangor, Malaysia

² Jeffrey Cheah School of Medicine and Health Sciences, Monash University Malaysia, Jalan Lagoon Selatan, Bandar Sunway, 47500 Subang Jaya, Selangor

³ Monash University Accident Research Centre, Wellington Rd, 3800 Clayton Victoria Melbourne, Australia

⁴ School of Medicine, Taylor's University, 1, Jalan Taylors, 47500 Subang Jaya, Selangor, Malaysia

ABSTRACT

Introduction: Work-related musculoskeletal disorders (WRMSDs) is an alarming occupational health concern worldwide. Nurses are among the professional at high risk of WRMSDs. **Objective:** This study explores the prevalence WRMSDs and the association with work engagement among nurses. **Methods:** This cross-sectional study used self-administered survey was disseminated to female nurses working at the hospitals in the Klang Valley, Malaysia. The Standardized Nordic Musculoskeletal Questionnaire (N-SNMQ) was used to determine the annual prevalence of WRMSDs. Level of work engagement was assessed using Utrecht Work Engagement (M-UWES). Multivariate logistic regression was performed to assess the association between WRMSDs and work engagement. **Results:** This study received high response rate (83.3%) with annual prevalence of 73.1%. Most common WRMSDs was reported in neck (48.9%) followed by feet (47.2%) while least was documented in arms and elbows (6.6%). After covariates adjustment (age, years of employment), the adjusted logistic regression analyses highly engaged nurses (AOR:0.71-0.74, 95%CI 0.56 – 0.95) were found to be unlikely sustained of WRMSDs. **Conclusion:** The findings of this study addressed high prevalence of WRMSDs among nurses. High work engagement could facilitate to reduce risk of WRMSDs, hence offer preventive strategies, making a substantial impact on reducing WRMSDs.

Keywords: Nurses, Musculoskeletal disorders, Work engagement

Corresponding Author:

Nur Azma Amin, PhD

Email: nurazma@unikl.edu.my

Tel: +603-8739 5894

INTRODUCTION

Over recent decades, the National Institute for Occupational Safety and Health (NIOSH) in the United States has listed Work related Musculoskeletal disorders (WRMSDs) as one of priority research areas with major research focus to study on the multi-factorial aetiology of WRMSDs (1). The WRMSDs in various occupational environments has been widely investigated, including among office (2), manufacturing (3) and healthcare (4). Warnakulasuriya et al. (2012) (5) and the team conducted a study in Sri Lanka has revealed that nurses were more likely to sustain WRMSDs compared to other occupational groups. This findings was accordance to the work by Karahan et al. (2009)(6) who confirmed

that nurses have twice the risk of low back pain (LBP) compared to other healthcare service groups.

The concept of work engagement emerges as a new paradigm of occupational psychology that focuses on the positive elements of organisational behaviours, such as workers' strength rather than their weakness. Work engagement is an extension of two well-known psychosocial job stress models, namely the Job Demand-Control-Support (JDCS) model (7) and the effort-reward imbalance model (8). It is also embedded in the Job Demand and Resources (JDR) model. In consonant with this idea, Work engagement is a positive aspect of occupational psychology (9) which focuses on the positive elements of organisational behaviours, such as the workers' strengths rather than their weaknesses. Work engagement was described of three domains: vigour, dedication, and absorption. Vigour is described as high levels of energy and mental endurance while working, whereas dedication

refers to being emotionally involved in the job with enthusiasm, inspiration, pride, and demanding experience. Absorption is characterised by being completely focussed at work, whereby time move fast and one is fully committed to the job (10). Work engagement is believed to play an attributive role associated with an employee's health and work performance (11). In the context of nursing industry, a positive working environment consists of decision making autonomy, achievement recognition, professional development support, quality patient care delivery, promotion of nursing leadership at the executive level and also technological support (12).

It stands to the reason that, a lack of any of the above elements can lead to disengagement. Investigating work engagement among nursing professionals is a fruitful starting point to understand potential risk injury. This is because, despite their job demanding nature, nurses are generally expected to be highly engaged and committed to their work (13). Although the relationship between work engagement and health is unclear, several studies suggested that work engagement partly mediates the effects of insufficient job resources (such as: lack of social support, poor organisational commitment and lack of decision making) to health status (14). In a large-scale study among Swedish healthcare workers suggested that disengaged workers were more prone to develop neck and lower back pain than their engaged peers (15). Work engagement was also apparent in moderating the adverse effects of psychological demands on health including WRMSDs (16). The study was therefore conducted to explore the association between WRMSDs and work engagement among nurses.

MATERIALS AND METHODS

Study population

This cross-sectional research recruited female nurses working at four (4) public hospitals in the Klang Valley, Malaysia. The hospitals were selected based on convenience sampling and supports offered by the hospital's management team. Nurses working in shift for at least one year in the participating hospitals and free from musculoskeletal symptoms at the time of data collection were eligible to participate in the study. Nevertheless, nurse who was pregnant, breastfeeding mother or at menopausal stage during data collection were excluded from the study. Decreasing reproductive hormones are associated with increased pain perception in women transitioning through menopause(17). The sample size was calculated using a single proportion (18) with confidence interval (CI) was set at 95%, α (5%) and 80% power of study to ensure sufficient sample size. Based on the prevalence rate of WRMSDs ($p=78\%$) (19), a total of 264 nurses were proposed for this study. However, to avoid under sampling and poor response, the proposed number was factored to 660 participants.

This study obtained ethics approval from the Monash University Human Research Ethics (MUHREC) (CF12/506-2012000809) and Medical Research and Ethics Committee (MREC), Ministry of Health, Malaysia (NMRR-12-234-11176). Upon ethics approval, briefing session was organized to communicate the information related to the study to the nurses at the respective hospital. Next, the study package of the self-administered questionnaires and informed consent was distributed to the participants, through their supervisor. Completed questionnaires were returned within a week in sealed envelope and deposited into a locked box located at the Chief Matron's office.

Survey questionnaire

This study used self-administered questionnaire which comprised of three (3) sections:

Section 1: Personal and job information

This section intended to retrieve (eg: age, race, academic qualification, Body Mass Index (BMI) and job information (eg: years of employment, working hours per week, monthly income). The nurses were also expected to indicate if their undergone either any of these conditions including pregnant, breastfeed, menopause or had history of non-occupational MSDs.

Section 2: Work-related musculoskeletal disorders (WRMSDs)

WRMSDs symptoms were measured using the self-administered Malay version of the Standardised Nordic Musculoskeletal Questionnaire (M-SNMQ)(4). An anatomical diagram that illustrated nine anatomical sites (neck, shoulder, upper and lower back, hands/wrists, arms, knee, thighs and feet) was attached to help the respondents to precisely identify the presence of musculoskeletal symptoms over the past 12 months (20). The nurses that selected 'yes' suggested the occurrence of WRMSDs related symptoms (pain, numbness, tingling, aching, stiffness or burning) at any anatomical area in past 12 months. Further, the nurses also indicated if the symptoms of WRMSDs had either affected daily activities, seeking treatment, medication dependency, and/ or taking medical. To further broaden the statistical analysis, the body regions were divided into four anatomical regions, region 1 (neck and shoulders), region 2 (wrists, arms, and hands), region 3 (upper and lower back) and region 4 (thighs, knees, ankles, and feet).

Section 3: Assessment of work engagement

The individual's work engagement level was measured using the Malay-translated version of Utrecht Work Engagement Scales (M-UWES)(21). This assessment tool consists of three subscales of vigour, dedication, and absorption with three items respectively (22). The items were scored based on a seven-point Likert scale (0 = "never" to 6 = "always"). The scores for each item were summed and divided according to number of

items in each subscale. High score indicates high level of work engagement (21). The factor analysis performed on the data in current study confirmed a three – factor model of M-UWES9 showed superiority, in accordance to Schaufeli and Bakker (22).

Data analysis

Prior to data analysis, sequential steps including data coding, entering and screening were performed on obtained data. The data were checked for completeness and the normality distribution was examined using the Kolmogorov-Smirnov test. Means and standard deviations were reported for continuous data, whereas frequencies and percentages were computed for categorical data. Chi-square (χ^2) test was performed to estimate the relationship between categorical risk factors and WRMSDs. Multivariate logistic regression (LR) was used to estimate the effect of the work engagement against WRMSDs. Adjusted OR (AOR) was calculated with 95% confidence interval (CI) to assess the risk factors of WRMSDs. All analyses were performed using the IBM Statistical Package for Social Sciences (SPSS) Statistics version 24.

RESULTS

Demographic and occupational profiles

Total of 550 questionnaires were returned (response rate:83.3%), however of these only 376 participants proceeded for analyses. Majority were Malays, married with age average of 30.58 (SD: 5.25) years. More than half of them were on service for more than five years, with an average of 7.38 (SD: 4.94) years. Likewise, approximately half of the participants served in the current hospital and unit for less than five years with average years of 5.26 (SD: 3.67) and 4.226 (SD: 3.67). Table I summarises the demographic and occupational profiles of the studied nursing population.

Prevalence of work-related musculoskeletal disorders (WRMSDs)

The present research indicates that the surveyed population encounters WRMSDs with an annual prevalence of 73.1%. In the previous 12 months, nearly half of the nurse's complaints of having WRMSDs at the neck followed by feet / angles (47.2%), upper back (40.7%), shoulders (37.0%), and lower back (35.3%), respectively. Approximately half of the nurses had WRMSDs in the neck followed by feet/ankles (47.2%), upper back (40.7%) and least in the arms/elbows (6.6%) past 12 months to the study. Figure 1 illustrates the annual prevalence of WRMSDs across different body sites of the surveyed population.

Work engagement

Table 2 shows the descriptive statistics for the subscales of the work engagement. The average overall score for work engagement (SD) was [4.55 (SD: 0.85)], vigour [4.46 (SD: 1.02)], dedication [4.97 (SD: 0.94)] and absorption

Table 1: Demographic and occupational profiles (N=376)

Variables	% (n)	Mean (SD)
Age (yrs.)		
≤30	53.70 (202)	30.58 (5.25)
>30	46.30 (174)	
Years of employment as nurses (yrs.)		
≤5	42.80 (161)	7.38 (4.94)
>5	57.20 (215)	
Years working at the current hospital (yrs.)		
≤5	60.40(227)	5.26(3.67)
>5	39.60(149)	
Years working at the current unit (yrs.)		
≤5	68.90(259)	4.26(3.02)
>5	31.10(117)	
Working hours/week (hrs.)		
≤48	85.90(323)	45.04(5.40)
>48	13.80(52)	
Races		
Malays	94.10(354)	
Non-Malays	5.90(22)	
Marital status		
Married	76.60 (288)	
Not married	23.40 (88)	
Level of education		
Tertiary (certificate/ diploma/ degree)	87.80 (330)	
Non-tertiary (lower and upper secondary)	12.20 (46)	
Type of assigned ward		
General/medical	78.50(295)	
Intensive care units	21.50(81)	

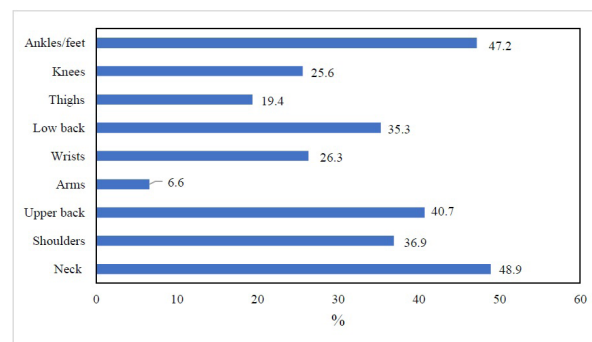


Figure 1: 12-month prevalence of WRMSDs according to anatomical sites

Figure 1 : 12 month prevalence of WRMSDs according to anatomical sites

[4.21(SD: 1.01)]. The internal consistency displays a satisfactory level of reliability for all subscales; overall ($\alpha=0.84$), vigour ($\alpha=0.74$), dedication ($\alpha=0.80$) except for the absorption domain ($\alpha=0.46$)(23). The result show that over 70% of the studied nurses scored an average of five on items of M-UWES9 subdomains, demonstrating a high engagement level. As depicts in Table II, the 'average' level was the most common categorisation for all subscales of M-UWES, with 41%, 47.1%, 53.5% and 50.3% for vigour, absorption, dedication and total

score, respectively. Less than 10% of the nurses had shown very low levels of M-UWES9 and its domain. Over 30% demonstrated high vigour while working, approximately 20% of the studied nurses displayed very high dedication and high absorption, respectively.

Furthermore, according to the outcomes of the Multifactor multivariate analysis of variance (MANOVA), of all observed demographic variables, only number of service years showed a significant impact on the level of work engagement. Nurses aged more than 30 years old scored higher for vigour ($F(1,375) = 5.23, p = 0.023, \eta^2 = 0.014$) compared to their younger counterpart. Nursing personnel with more than five years of working experience in the industry obtained a significantly higher score than nurses with less experience for vigour [4.56 (SD: 0.06) versus 4.31 (SD: 0.07)], dedication [5.19 (SD: 0.06) versus 4.96 (SD: 0.06)], absorption [4.41 (SD: 0.06) versus 4.22 (SD: 0.07)] and total [4.69 (SD: 0.05) versus 4.47 (SD: 0.06)]. The present study also reports significantly higher absorption scores among nursing personnel stationed in the medical wards compared with nurses working in the medical wards [4.37 (SD: 0.05) versus 4.18 (SD: 0.10)] ($F(1,375) = 3.30, p = 0.070, \eta^2 = 0.009$). Nurses working in the same current hospitals for more than

five years appeared to score significantly higher for overall [4.71 (SD: 0.06) versus 4.52 (SD: 0.05)] ($F(1,375) = 5.32, p = 0.022, \eta^2 = 0.014$), vigour [4.57 (SD: 0.07) versus 4.37 (SD: 0.06)] ($F(1,375) = 4.18, p = 0.042, \eta^2 = 0.011$) and dedication [5.22 (SD: 0.07) versus 5.00 (SD: 0.05)] ($F(1,375) = 6.31, p = 0.012, \eta^2 = 0.017$). There were no significant associations reported between work engagement and marital status nor with working hours.

Work engagement and work musculoskeletal disorders (WRMSDs)

Nurses presenting WRMSDs symptoms demonstrated a lower average score (SD) of work engagement [4.51 (SD: 0.83)] in comparison to those free from the symptoms [4.66 (SD: 0.83)]. than vigour, there were no group differences in average scores for any of the subdomains of M-UWES9. Initially, the simple logistic regression demonstrated that work engagement was significantly a protective factor that reduce risk of WRMSDs in region 1 (neck and shoulders) (OR: 0.70, 95%CI: 0.55-0.91) and region 3 (OR: 0.73, 95%CI: 0.57-0.94). Following the adjusted logistic regression (AOR) analyses, the AOR analyses revealed that high level of vigour significantly reduced the risk of WRMSDs in region 1 (neck and shoulders) (AOR: 0.75, 95%CI 0.60-0.92) and region 3 (upper and lower

Table II : Work engagement of studied nurses (N=376)

Variables	Vigour	Dedication	Absorption	Work engagement
Cronbach's α	0.74	0.80	0.46	0.84
Mean (SD)	4.46 (1.02)	4.97 (0.94)	4.21 (1.01)	4.55 (0.85)
Perceived level (%)				
Very low	7.4	5.5	2.7	4.0
Low	11.4	19.1	31.4	21.0
Average	41.0	53.5	47.1	50.3
High	32.7	0.0	12.8	22.6
Very high	7.4	21.5	6.1	2.1

Table III : Modelling work engagement as predictor of WRMSDs across four body regions among nurses (N=376)

Variable	Model	Region 1 ^a (n=209)	Region 2 ^a (n=99)	Region 3 ^a (n=133)	Region 4 ^a (n=195)
Work engagement					
Work engagement	I ^b	0.70 (0.55-0.91)*	0.93 (0.71-1.22)	0.73 (0.57-0.94)*	0.88 (0.69-1.12)
	II ^c	0.71 (0.56-0.92)*	0.95 (0.69-1.27)	0.74 (0.58-0.95)*	0.86 (0.68-1.10)
High vigour	I ^b	0.77 (0.62-0.94)*	0.92 (0.74-1.16)	0.76 (0.62-0.93)**	0.91 (0.74-1.11)
	II ^c	0.75 (0.60-0.92)**	0.93 (0.70-1.17)	0.88 (0.63-0.96)*	0.83 (0.62-1.11)
High dedication	I ^b	0.75 (0.59-0.94)**	0.94 (0.74-1.20)	0.79 (0.64-0.99)	0.87 (0.70-1.09)
	II ^c	0.82 (0.61-0.92)*	0.94 (0.75-1.19)	0.75 (0.59-0.99)*	0.88 (0.63-1.23)
High absorption	I ^b	0.82 (0.66-0.99)*	0.99 (0.79-1.25)	0.85 (0.69-1.04)	0.94 (0.77-1.15)
	II ^c	0.72 (0.57-0.91)**	0.96 (0.78-1.23)	0.84 (0.69-1.04)	0.99 (0.76-1.28)

^aNumber of nurses reporting WRMSDs in that body region

^bUnivariate analysis

^cAOR (Adjusted odds ratio) for covariates (types of ward, years of employment,)

p value significant: *p<0.05; **p<0.01

back)(AOR: 0.88, 95%CI 0.63-0.96). High dedication has also significantly reduced the risk of WRMSDs in region 1(neck and shoulders) (AOR:0.82, 95%CI 0.61-0.92) and region 3 (upper and lower back) (AOR: 0.75, 95%CI 0.59-0.99).

DISCUSSION

This study documented the role of work engagement and annual prevalence of WRMSDs among nurses working in highly populated urban area in Malaysia. The current findings demonstrated that three out of four nurses developed symptoms of WRMSDs in at least one body site over the last 12 months, likewise observed in a study among Lebanese nurses (24). The 12 months prevalence of WRMSDs was doubled than in general population (25). This is expected due to the location of the studied hospitals in the populated area of Klang Valley. This exposed the nurses to greater physical and psychological load, hence increased the exposure risks. Interestingly, the annual prevalence of WRMSDs among nurses was varied internationally. For instance, a study among Portuguese nurses described higher annual prevalence of 89% (26). In contrast, large scale study across Thailand observed approximately only half of the registered nurses (RN) had WRMSDs for last 12 months of the study (27). Despite common risk factors, variation in the prevalence rates of WRMSDs documented in different studies site could be influenced by several technical factors such as non-standardized terminology (20) and variation in the research instruments used (28). Next, the current study presented that most common WRMSDs was reported in the neck, feet/ankles and upper back while least in arms/elbow. Ribeiro et al (2016)(26), in a study among Portuguese nurses documented different prevalent patterns with highest prevalent recorded in low back (63.1%) and neck (50.1%). Differences in prevalent rates may be explained by the workplace environment.

Individual's level of work engagement is relevant for an organisation. Work engagement illustrates worker's perception related to the job satisfaction (9) and pursuit of learning (29).

Limited research explored the protective roles of work engagement to worker's health, including WRMSDs. This study is the first of its kind that investigates the interaction of work engagement and WRMSDs. The work engagement score suggested that the nurses were highly engaged in congruent with earlier findings (30,31). These results were in agreement with previous research conducted in Spanish nurses using extended version of UWES (30). The results of this study indicate significantly higher average score on vigour was reported among older nurses than their younger counterparts. Previous research on the generation effects to work engagement among hospitality workers suggested similar evidences (32). Younger workers usually put greater emphasis on

work-life balance and personal life, therefore making them less devoted to work. Work engagement contributes towards good health (33) which explains the significant protective effect of work engagement against WRMSDs in this study. Highly vigoured or dedicated nurses were unlikely to develop WRMSDs in the past 12 months, in track with previous empirical evidences shown in different occupational settings such as industrial and education (34).

This work also considered potential limitation as follows. First, given that it was a cross sectional research, the findings should be viewed with caution, since their causality is not implied. Second, since the data was obtained through self-administered technique, hence, the responses can be biased because the nurses may provide socially favourable answers to their actual experiences (35).

CONCLUSION

In conclusion, the results of this study showed that WRMSDs is common occupational health issue among nurses in Malaysia. The study also indicates that highly dedicated and hardworking (vigour) are protective factors that can potentially reduce the risk of WRMSDs. Hence, the hospital management, thereby can use proactive approaches to improve nurse's work engagement. The information also should serve as reference for more future work to explore the role of work engagement in reducing risk of WRMSDs. Future work should also expand to other groups of nursing professions in Malaysia both private and government to validate the present findings.

ACKNOWLEDGEMENT

The authors would like to acknowledge, with gratitude that we appreciate the support from the Ministry of Health Malaysia for giving the permission to conduct this study.

REFERENCES

1. Marras WS, Cutlip RG, Burt SE, Waters TR. National occupational research agenda (NORA) future directions in occupational musculoskeletal disorder health research. *Appl Ergon.* 2009;40(1):15–22.
2. Mohammadipour F, Pourranjbar M, Naderi S, Rafie F. Work-related Musculoskeletal Disorders in Iranian Office Workers: Prevalence and Risk Factors. *J Med Life.* 2018;11(4):328–33.
3. Hembecker PK, C. Reis D, Konrath AC, A. Gontijo L, Eugenio EA. Investigation of musculoskeletal symptoms in a manufacturing company in Brazil: a cross-sectional study. *Brazilian J Phys Ther.* 2017;21(3):175–83.
4. Nur Azma BA, Rusli BN, Oxley JA, Quek KF. Work Related Musculoskeletal Disorders in Female

- Nursing Personnel: Prevalence and Impact. *Int J Collab Res Intern Med Public Heal*. 2016;8(3):23–44.
5. Warnakulasuriya SSP, Peiris-John RJ, Coggon D, Ntani G, Sathiakumar N, Wickremasinghe AR. Musculoskeletal pain in four occupational populations in Sri Lanka. *Occup Med*. 2012;62(4):269–72.
6. Karahan A, Kav S, Abbasoglu A, Dogan N. Low back pain: prevalence and associated risk factors among hospital staff. *J Adv Nurs*. 2009;65(3):516–24.
7. Johnson J V, Hall EM. Job strain, work place social support, and cardiovascular disease: a cross-sectional study of a random sample of the Swedish working population. *Am J Public Health*. 1988;78(10):1336–42.
8. Siegrist J. Adverse health effects of high-effort/low-reward conditions. *J Occup Health Psychol*. 1996 Jan;1(1):27–41.
9. Bakker, A. B., Schaufeli, W.B., Leiter, MP. & Taris TW. Work engagement: An emerging concept in occupational health psychology. *Work Stress*. 2008 ;22(3):187–200.
10. Schaufeli WB, Salanova M, Gonzalez-Roma V, Bakker A. The measurement of engagement and burnout: A two sample confirmatory factory. *J Happiness Stud*. 2002;3:71–92.
11. Rongen A, Robroek SJW, Schaufeli W, Burdorf A. The Contribution of Work Engagement to Self-Perceived Health, Work Ability, and Sickness Absence Beyond Health Behaviors and Work-Related Factors. *J Occup Environ Med*. 2014;56(8):892–7.
12. American Association of Colleges of Nursing. Hallmarks of the professional nursing practice environment. *J Prof Nurs*. 2002;18(5):295–304.
13. Noraini Othman & Aizzat Mohd Nasurdin. Social support and work engagement: a study of Malaysian nurses. *Journal Nursing Management*. 2013;21(8):1083–90.
14. Bakker, AB & .Demerouti E. Towards a model of work engagement. *Career Dev Int*. 2008;13(3):209–23.
15. Peterson, U, Demerouti, E, Bergstrom, G, Samuelsson, M, Asberg, M & Nygren A. Burnout and physical and mental health among Swedish healthcare workers. *J Adv Nursing*. 2008;62(1):84–95.
16. Bakker, A. B.Demerouti, E. WB, Hakanen JJ. Job resources boost work engagement, particularly when job demands are high. *J Educ Psychology*. 2007;99(2):274–84.
17. Dugan S a, Powell LH, Kravitz HM, Everson Rose S a, Karavolos K, Luborsky J. Musculoskeletal pain and menopausal status. *Clin J Pain*. 2006 May;22(4):325–31.
18. Daniel WW. Biostatistics: A foundation for analysis in the health sciences. New York: John Wiley & Sons. Inc.; 1999.
19. Tinubu BMS, Mbada CE, Oyeyemi AL, Fabunmi AA. Work-related musculoskeletal disorders among nurses in Ibadan, South-west Nigeria: a cross-sectional survey. *BMC Musculoskeletal Disorders*. 2010 Jan;11(12):1–8.
20. Kuorinka I, Jonsson B, Kilbom A, Vinterberg H, Biering-Sørensen F, Andersson G, et al. Standardised Nordic questionnaires for the analysis of musculoskeletal symptoms. *Applied Ergonomics* 1987 Sep;18(3):233–7.
21. Schaufeli, W.B, Bakker, A.B & Salanova M. The Measurement of Short Questionnaire A Cross-National Study. *Educ Psychol Meas*. 2006;66(4):701–16.
22. Schaufeli, W.B & Bakker A. Utrecht Work Engagement Scale: Preliminary Manual. The Netherlands: Department of Psychology. Utrecht University; 2004.
23. Schmitt N. Uses and abuses of coefficient alpha. *Psychol Assess*. 1996;8(4):350–3.
24. Younan L, Clinton M, Fares S, Jardali F El, Samaha H. The relationship between work-related musculoskeletal disorders, chronic occupational fatigue, and work organization: A multi-hospital cross-sectional study. *J Adv Nurs*. 2019;75(8):1667–77.
25. James SL, Abate D, Abate KH, Abay SM, Abbafati C, Abbasi N, et al. Global, regional, and national incidence, prevalence, and years lived with disability for 354 Diseases and Injuries for 195 countries and territories, 1990-2017: A systematic analysis for the Global Burden of Disease Study 2017. *Lancet*. 2018;392:1789–858.
26. Ribeiro T, Serranheira F, Loureiro H. Work related musculoskeletal disorders in primary health care nurses. *Appl Nurs Res*. 2017;33:72–7.
27. Thinkhamrop W, Sawaengdee K, Tangcharoensathien V, Theerawit T, Laohasiriwong W, Saengsuwan J, et al. Burden of musculoskeletal disorders among registered nurses: Evidence from the Thai nurse cohort study. *BMC Nurs*. 2017;16(1):1–9.
28. Heiden B, Weigl M, Angerer P, Müller A. Association of age and physical job demands with musculoskeletal disorders in nurses. *Appl Ergonomics*. 2013;44(4):652–8.
29. Sonnentag S. Recovery, work engagement, and proactive behavior: a new look at the interface between nonwork and work. *J Appl Psychology*. 2003;88(3):518–28.
30. González-Gancedo J, Fernández-Martínez E, Rodríguez-Borrego MA. Relationships among general health, job satisfaction, work engagement and job features in nurses working in a public

- hospital: A cross-sectional study. *J Clin Nurs*. 2019;28(7–8):1273–88.
31. Jenaro C, Flores N, Orgaz MB, Cruz M. Vigour and dedication in nursing professionals: towards a better understanding of work engagement. *J Adv Nurs*. 2011 ;67(4):865–75.
 32. Park J, Gursoy D. Generation effects on work engagement among U.S. hotel employees. *Int J Hosp Management*. 2012;31(4):1195–202.
 33. Demerouti E, Bakker, AB, Schaufeli W, Jonge J, Janssen PM. Burnout and engagement at work as a function of demands and control. *Scand J Work Environ Health*. 2001;27(4):279–86.
 34. Bakken B, Torp S. Work engagement and health among industrial workers. *Scand J Organ Psychol*. 2012;4(1):4–20.
 35. Cook C. Mode of administration bias. *J Man Manip Ther [Internet]*. 2010;18(2):61–3.