

Original Research Paper

An Investigation of Work-Related Fatigue Levels and Related Factors among Emergency Nurses: A Primary Quantitative Study

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Abstract: One of the most frequent phenomena among shift workers, particularly nurses, is work-related fatigue. There is a necessary demand for research in the area concerning the relationship between socio-demographic factors, occupational variables and work-related fatigue among Arabic, including Jordanian nurses, given the lack of knowledge. This study targets evaluating the magnitude of the relationship between socio-demographic and occupational factors and work-related fatigue among Jordanian nurses who work in emergency care venues. A descriptive correlational study was used. A non-probability based convenient sampling technique was applied, capturing 220 emergency nurses in Jordan. Measures included socio-demographic data, Occupational variables and Fatigue Exhaustion/Recovery Scale (OFER 15). In comparison to chronic and inter-shift fatigue, acute work-related fatigue attained the highest average score (Mean = 61.63, SD +27.17). Acute fatigue had a significant but weak relationship with years of experience, age, marital status, income and shift-work had an imperative relationship with acute work-related fatigue. Further, the chronic fatigue and inter shift (recovery) were correlated with marital status, years of experience, income and shift-work. The findings of this study provided empirical data that would help develop procedures to diminish levels of work-related fatigue among Jordanian emergency nurses, which would enhance nurses and patients' positive health outcomes.

Keywords: Work-Related Fatigue, Chronic Fatigue, Acute Fatigue, Socio-Demographic Factors, Inter-Shift Fatigue

Introduction

Background

Fatigue is a state of exhaustion, tiredness and loss of energy. When fatigued, an individual is unable to perform their duties and responsibilities to the optimum (Barker and Nussbaum, 2011; Al-Masaeed *et al.*, 2020). Fatigue has an impact on reducing an individual's functioning and productivity levels. It is a phenomenon experienced across all professions. The nursing profession is not an exception to fatigue. Studies indicate prevailing fatigue levels among nurses across the globe. Previous studies have used multiple tools, including the Fatigue Assessment tool (FAS) and Occupational Fatigue Exhaustion Recovery tool (OFER 15), among others when measuring nurses fatigue levels (Trendall, 2000; Winwood *et al.*, 2005; Martin, 2015; Al-Masaeed *et al.*, 2020).

The tools are a statistical and quantitative basis for examining the prevalence and fatigue levels among nurses. Evidence indicates that there exists fatigue among nurses. The handling of fatigue is different. While some nurses and existing systems create adaptation/mitigation strategies, others fail to employ the adaptation systems. The presence of mitigation strategies allows for adaptation and reduced fatigue to tiredness and, eventually, an adaptation to managing and controlling fatigue triggers (Sagherian *et al.*, 2017a; 2017b). On the other hand, a failure to employ mitigation strategies leads to fatigue progression into total exhaustion and thus increased normal working conditions for the nurses. The short term implications of prolonged fatigue among nurses include health deterioration, a negative impact on their social being

and interactions and a decline in the nurses' motivation (Samaha *et al.*, 2007). In the long run, the implications include long term health complications, the risk of medical errors and the increased risk of nurses exiting the nursing profession. Some of the significantly impacted nurses are the emergency department nurses. They are mandated to support, help, care for and treat critically ill and emergency cases. Such would include accident and disaster survivors, among other patient categories (LeGal *et al.*, 2019; Al-Masaeed *et al.*, 2020).

Unlike other hospital departments, nurses working in the Emergency Department (ED) have highly dependent patients who rely on their help for basic functions such as hygiene, including cleaning and other biological activities such as passing urine and stool. The increased demand for nurses' care and support exposes them to fatigue risk. Studies in different jurisdictions indicate that some of the prevalent types of fatigue among ED include physical, mental, acute, chronic and inter-shift recovery fatigue types (Oh *et al.*, 2011; Ismail *et al.*, 2019). These different fatigue types emerge due to the working conditions and the nature of expectations that the hospitals and the patients have on their nurses. Although existing literature agrees on the prevalence of fatigue among ED nurses, differences exist in prevalence levels. Some of the listed differences in the literature include (i) nurse's socio-demographics, (ii) occupational factors.

On socio-demographic factors, studies indicate a correlation between the dimensions and variables of age, gender, marital status and level of earnings on nurses' fatigue levels prevalence and their ability to address the fatigue and exhaustion risks. Equally, on occupational factors, the findings in the literature indicate a relationship between fatigue and the nurses' occupational dimensions of served departments, career ranks and functions and responsibilities on their fatigue and exhaustion levels and risks (Sawatzky and Enns, 2012; Rozo *et al.*, 2017). Nevertheless, a preliminary analysis of the literature indicates a lack of enough literature on the factors influencing ED nurses' fatigue levels and prevalence rates in Jordan. This formed the basis for the primary study development.

Aims and Objectives

The study evaluates the levels and correlating factors of work-related fatigue among Jordanian nurses in the ED. Hence, it addresses the following research questions:

- What are the work-related fatigue levels among ED nurses in Jordan?
- Are socio-demographic factors correlated to work-related fatigue among ED nurses in Jordan?
- Are occupational factors correlated to work-related fatigue among ED nurses in Jordan?

Materials and Methods

Design, Sampling and Setting

A descriptive correlational design was used to recruit nurses working in ED through a non-probability convenience sampling approach. The sampling size was estimated using a medium effect size of (0.22), power of (0.85) and (0.05) levels of significance, with a correlation. A sample of 179 participants was needed. The study sample size was determined based on the statistical proportion of 10% for all sample bases population base, as long as the sample base does not exceed 1000. The target ED population of nurses in Jordan was estimated at 1790. Thus, the 10% of the sample size was at 179 respondents. The target population is ED nurses in Jordan participating hospitals. The study recruited 220 participants to compensate for dropout and any missing data. The inclusion criteria were nurses who work in ED work on a full-time basis, with work experience of at least a year before data collection time. Exclusion criteria include physical or psychological problems and pregnant female nurses. This study was carried out in the emergency department of four hospitals in Jordan, encompassing all health sectors, including governmental, private, educational and military, in different regions.

Measurements

The survey used was structured and self-administered. It consisted of the following socio-demographic questionnaire and occupational questionnaire; both are developed by the researchers based on the existing literature. In addition to that, the (OFER15) scale was used. The following paragraph discusses the scales:

- 1) Basic socio-demographic data questionnaire. Researchers established this scale based on existing literature and include gender, age, marital status, educational level, income and smoking
- 2) Occupational data questionnaire; it involves; years of experience and shift-work
- 3) Occupational Fatigue Exhaustion/Recovery scale (OFER15). Winwood *et al.* (2006a) founded the OFER15 scale. This scale consists of three subscales that assess acute fatigue, chronic fatigue and inter-shift (recovery). Each composed of five items rated on a Likert scale, using the following format, 0 = strongly disagree to 6 = strongly agree. Items numbers (9, 10, 11, 13 and 15) were reverse coded. The total scores for each subscale ranged from 0 to 100. Each subscale was totalled up, divided by 30 and multiplied by 100. Higher scores then indicated higher levels and a more dominant type of work-related fatigue. This scale is valid and reliable, with a Cronbach's alpha for the total scale was >0.84 (Winwood *et al.*, 2005). It was translated into

Arabic and various other languages worldwide. In this study, the Arabic version of the OFER15 was used. The internal consistency reliability was evaluated using Cronbach's alpha, which was 0.85

Ethical Considerations

The Institutional Review Board (IRB) approval to carry out the current research was sought from the ethics committees in the Al-Zaytoonah University of Jordan (reference number 11/179/2017-2018, Ministry of Health (reference number MOH REC 180016) in addition to the ethics committee in each participated hospital. The instructions, the purposes of the study, the benefits and the risks were explained to each participant. Confidentiality and anonymity of the participants were ensured; hence, all participants' identifiers were removed from the final report. Informed consent was obtained from each participant.

Data Collection

The data was amassed from early January to late March 2018. The first researcher approached ED's in-charge nurse in every participated hospital and clarified the aim of the study. After that, the nurse in charge was asked to allow the primary researcher to contact potential participants. Those who agreed to participate and fulfilled the inclusion criteria were handed a survey. A cover letter was attached to each survey and it included a consent form, the aim of the study, a paper of instructions and an empty envelope to secure the survey completed once they complete it. Then, after one week, the researchers collected envelopes from the study volunteers.

Data Analysis

The Statistical Package for Social Sciences (SPSS), version 23.0, was used to enter and analyse data. Descriptive statistics (e.g., frequency, percentage, mean, standard deviation and range) were obtained to describe the socio-demographic characteristics and work-related fatigue variables. To research the relationship between the socio-demographic characteristics and work-related fatigue (acute, chronic and inter-shift (recovery)), correlation tests, including Pearson's and Point-biserial, were conducted. The results were deemed significant at $p < 0.05$. A randomised sample strategy was adopted to control the risk of confounding variables.

Findings and Analysis

Socio-Demographic Characteristics of the Participants

Out of 220 participants, 63.6% were male, 52.3% were married, 57.3% non-smokers and 82.3% reported having a bachelor's degree (Table 1). The study sample's average age was 28.54 (SD ± 3.78), ranging between 23-46 years. The

mean of the income was 496.04 JD (SD ± 151.16). The average of work experience years was 5.47 (SD ± 3.91).

Occupational Factors

All of the volunteers were working in rotating shifts with 8 hrs/day, 34.1% were on day-shifts (7 am-2 pm), while 9.5% afternoon-shifts (2-9 pm) and 19.1% were on night-shifts (9 pm-7 am). More details are depicted in Table 1.

Levels of Work-Related Fatigue

In Table 2, the levels of work-related fatigue are shown, including acute, chronic and inter-shift (recovery). The highest frequently reported work-related fatigue was the acute type (M = 61.63, SD +27.17), whereas, inter-shift fatigue was the least frequently reported kind of fatigue (M = 56.25, SD +17.39). Table 2 shows the mean and the SD for all kinds of work-related fatigue.

Correlation Between Socio-Demographic and Occupational Factors and Work Related Fatigue

In Table 3, the extent of the relationship between socio-demographic variables and work related fatigue was depicted. To evaluate the direction and depth of relationship between the socio-demographic factors and work-related fatigue, Pearson (r) and Point-biserial (r p.b) correlation was performed. The results showed that acute fatigue was significantly and positively related to age (r (220) = 0.18; $p < 0.01$). Income was correlated positively with acute fatigue and chronic fatigue, (r (220) = 0.18; $p < 0.01$), (r (220) = 0.33; $p < 0.01$), respectively. Years of experience was also positively correlated with acute fatigue and chronic fatigue at (r (220) = 0.39; $p < 0.01$), (r (220) = 0.23; $p < 0.01$), (r (220) = 0.29; $p < 0.01$) respectively in addition to that, inter item shift recovery showed a significant correlation with income (r (220) = 0.24; $p < 0.01$). A critical finding in the correlation analysis was the weak correlation between the socio and occupational variables to the levels of fatigue among the ED nurses. The correlation index runs from a lowest -1 to highest 1 values. The values obtained were positive but weak, with a correlation index for relationship between marital status and inter-shift recovery fatigue as the highest of all at 0.045, which was still a weak correlation. More details are shown in Table 3. In order to study the relationship between work-related fatigue and gender, marital status, level of education, shift-work and smoking, Point-biserial correlation was performed. Table 3 demonstrates a significant positive relationship between marital status and acute fatigue (r (220) = 0.14; $p < 0.05$) and inter-shift (recovery) (r (220) = 0.14; $p < 0.05$). In addition, shift-work was positively correlated with acute fatigue (r (220) = 0.28; $p < 0.01$), chronic fatigue (r (220) = 0.20; $p < 0.01$) and inter-shift (recovery) (r (220) = 0.19; $p < 0.01$).

Table 1: Socio-demographic characteristics and occupational factors of the participants (N = 220)

	Characteristics	N	%
Socio-demographic factors	Age		
	M = 28.54; SD +3.78; R = 23-46 years		
	Gender		
	Male	140	63.6
	Female	80	36.4
	Education		
	Diploma	24	10.9
	Bachelor	181	82.3
	Postgraduate	15	6.8
	Marital status		
	Single	96	43.6
	Married	115	52.3
	Divorced	7	3.2
	Widowed	2	0.9
	Occupational factors	Income	
M = 496.01; SD +151.16; R = 250-950			
Smoking			
Smoker		94	22.7
Non-smoker		126	77.3
Work-shift			
Day-shift (AM)		75	34.1
Evening-shift (PM)		26	11.8
Night-shift (ND)		42	19.1
BC-shift		27	12.3
ABC-shift	50	22.7	
Experience/years			
M = 5.47; SD +3.91; R = 1-20 years			

N = Number, % = Percentage, M = Mean, SD = Standard Deviation, R = Range

Table 2: Levels of work-related fatigue among ED nurses (N = 220)

Variables	Mean	Standard deviation
Acute fatigue	61.63	±27.17
Chronic Fatigue	57.18	±17.41
Inter-shift recovery	56.25	±17.39

Table 3: Correlation between socio-demographic and occupational factors and work-related fatigue

Factors	Work-related fatigue					
	Acute fatigue		Chronic fatigue		Inter-shift recovery	
	r	p	r	p	r	p
Age	0.18	0.009**	0.07	0.289	0.11	0.107
Years of experience	0.39	0.000**	0.23	0.000**	0.29	0.000**
Income/month	0.41	0.000**	0.33	0.000**	0.24	0.000**
Gender	r p.b	p	r p.b	p	r p.b	p
Marital status	0.07	0.339	0.06	0.368	0.09	0.200
Educational level	0.14	0.033*	0.12	0.068	0.14	0.045*
Work-shift	0.11	0.122	0.13	0.051	0.05	0.463
Smoking	0.28	0.000**	0.20	0.003**	0.19	0.004**
	0.06	0.358	0.12	0.070	0.11	0.121

*Significant at the 0.05 level; **Significant at the 0.01 level

Discussion

This research has indicated high levels of work-related fatigue among ED nurses in Jordan; however, acute fatigue had attained the highest level. Similarly,

previous studies have also reported that fatigue is prevalent among nurses, particularly the acute type of work-related fatigue (Hazzard *et al.*, 2013; Cochran, 2014; Zhou and Fang, 2015). Possible explanations for these findings are that the duration of a work shift

(Adriaenssens *et al.*, 2011; Geiger-Brown *et al.*, 2012) as well as time and the frequency of a work shift (Winwood *et al.*, 2006b; Han *et al.*, 2014; Dara *et al.*, 2016) adding negative consequences on nurses' health. For example, working during night hours would alter the circadian rhythm, significantly influencing the biological o'clock (Boivin and Boudreau, 2014). The impacts of the circadian rhythm lead to erratic sleeping patterns among nurses. Consequently, the nurses are fatigued and often exhausted and even sleeping, dozing off and feeling dizzy during their working shift hours. This has the effect of increasing their in-shift acute fatigue levels. Besides, nurses in ED in Jordan undertake increased workload and responsibilities. They impact increasing their physical fatigue (due to a large number of activities per shift) and mental fatigue (due to the lack of in-shift enough breaks and relaxation exercises and techniques). Others include the existing patient culture where the co-patients increase the demand and stress on the nurses, thus not only increasing their workload but also adding to their tensions and workplace stress through numerous and, at times, uncoordinated demands by the co-patients and the patient families (Seeman, 2016; Awooda, 2020).

Consequently, the mentioned issues would increase work-related fatigue levels and lead to more stressful work conditions and vice versa. This study has shown regarding the relationship between socio-demographic factors and work-related fatigue that acute fatigue positively correlated to age, given that older nurses experienced acute fatigue more than younger nurses did. These results are coherent with previous studies that reported that aging is positively associated with work-related fatigue among nurses (Adriaenssens *et al.*, 2011; Meeusen *et al.*, 2014; Rahman *et al.*, 2017). However, this study's findings are incoherent with another previous study (Ho *et al.*, 2013), which showed that nurses' age was negatively correlated to acute fatigue. Additionally, other previous literature supported that age and work-related fatigue were not correlated (except inter-shift (recovery) (Adriaenssens *et al.*, 2011; Raftopoulos *et al.*, 2012; Rahman *et al.*, 2016). We believe that the age results are inconclusive and this could be due to different ecological locations and different genetic makeups. Hence, further studies in relation to age and work-related fatigue are paramount to reach conclusive results. This study demonstrates a positive correlation between work experience and all types of work-related fatigue. These results could relate to the fact that work capacity is reduced and work-related fatigue is increased due to working long periods in the same workplace (Hilleshein and Lautert, 2012).

Interestingly, recent studies have shown that work years' experience was negatively correlated to fatigue. Fatigue was reported more among nurses who had fewer years of experience than those who had more experience

(Ho *et al.*, 2013; Rahman *et al.*, 2016). This could be linked to the fact that senior nurses can cope with the constraints in relation to the time and workforce shortage. Moreover, this study revealed a positive relationship between income and work-related fatigue including, acute, chronic and inter-shift. This could be explained by the fact that low income could lead to anger, stress and demoralization for income is a basic need for the workforce to maintain good living standards (Sadeghniaat-Haghighi and Yazdi, 2015). Hence, it is plausible that those who fail to provide good income from their jobs would suffer work-related fatigue (Çelik *et al.*, 2017). The current study results show that marital status positively correlated to acute fatigue and inter-shift (recovery) wherein married or divorced nurses reported more acute fatigue levels and inter-shift recovery than single nurses. It is well known that married nurses need to manage their work responsibilities and their marriage and home chores. The basis for the higher fatigue levels among female and married nurses could be derived from the social roles theory and culture dimensions and inclinations in Jordan.

Although a highly collective society, the social roles are strategically defined among men and women. The women in the society are allocated a larger number of domestic and home making parenting responsibilities. This adds to the list and duties on their off the shift periods. As a result, this leads to minimal rest intervals between the end of one shift and another shift. In the long run, this exposes them to increased fatigue risks than their male nursing peers (Kandolin, 1993; Oyane *et al.*, 2013; Sagherian *et al.*, 2017a).

Nevertheless, there lack enough quantitative findings to demonstrate the actual extent to which domestic responsibilities among married nurses increase their exposure levels to the risk of fatigue. Hence, nurses who were married experienced work-related fatigue levels that were higher in comparison to their counterparts who were single at the time of the study. The marital status for the married nurses implied additional responsibilities such as parenting and bringing up their children. Past studies have demonstrated the relationship between the nurses' number of dependants and their fatigue levels. The married nurses' dependents expanded their off the shift responsibilities scope, thus implying a low recovery rate. Their fatigue rates are predominantly higher on inter-shift recovery fatigue as contrasted to the single female nurses (Sveinsdottir, 2006; Oyane *et al.*, 2013).

In contrast, previous studies (Raftopoulos *et al.*, 2012; Bazazan *et al.*, 2014) claimed no significant relationship between marital status and work-related fatigue. This study revealed a positive correlation between night work shifts or extended work shifts (BC shifts) and work-related fatigue (acute, chronic fatigue and inter-shift (recovery)). Previous studies have also

revealed that nurses working on night-shifts reported more work-related fatigue than nurses working on day-shifts (Winwood *et al.*, 2006b; Kunert *et al.*, 2007). These results might be due to the negative effects a work shift has on circadian rhythm, which impacts the quality of sleep (Boivin and Boudreau, 2014), thus increasing the risk of experiencing fatigue (Kunert *et al.*, 2007). Importantly, working on night-shifts was proven to negatively affect the workforce's health and lead to various health problems, including sleep problems, fatigue, cardiovascular and gastrointestinal diseases (Vasconcelos *et al.*, 2012).

Limitations

The study has its main strengths in adopting and collecting primary data. It sampled and targeted Jordanian ED nurses. The results obtained were statistically analysed, presenting a quantified fatigue prevalence index and the relationship between social-demographic and occupational factors' impact on ED nurses fatigue. The OFFER 15 tool, which is validated and approved, increases the study findings' reliability. Although the study yielded significant results, the correlation was weak. This variable could have been influenced by the uneven distribution of the number of nurses for the shifts over the study development and data collection period. Further, the influences of other non-tested external factors such as teamwork and collaboration, number of nurses per shift and the management policy variances across select hospitals could have led to the weak correlation between the variables. This led to a finding where although correlated, the strength was not enough to establish a high predictor value for the independent variables influence and causative extent on the dependent factor (fatigue). The generalisation of the findings should be considered with caution. Future studies should narrow down to a specific hospital where teamwork, number of nurses per shift, policy impacts and other work environment factors can be controlled and accounted for.

Practical Implications

This study is crucial for healthcare professionals, nursing managers and policymakers in which it provides insight in relation to the safety of nurses and patients. Hence, it is vital to establish suitable measures and interventions to manage and reduce work-related fatigue levels among ED nurses. Therefore, improving the ED's work environment would directly enhance the clarity of nurses' role and their satisfaction and the nurses' and patients' outcomes. The current study results set the stage for the vitality of a continuous assessment of the work environment among nurses. Nonetheless, evaluating working conditions in light of the socio-demographic and occupational variables is vital for nurses' and patients' positive outcomes. According to their demographics and occupational factors, recognizing the needs of the emergency nurses would provide directions

for development of intervention programs that specifically target work-related fatigue.

Conclusion

The findings demonstrate a correlation/relationship between fatigue levels among ED nurses and their occupation and socio-demographic variables. Nevertheless, the relationships' predictor values are weak as the interaction between the variables is not in isolation but is influenced by the external variables such as work policy, teamwork and culture. Future studies should focus on examining and controlling the extent to which the immediate environment serves as a mediating factor between fatigue and ED nurses' social-demographic and occupational factors. Further, developed policies, strategies and mitigation factors should be contextualized and customised from one ED nurse's working context and situation to the next.

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Author's Contributions

Khaldoun Ismail:

- Conceptualization
- Methodology
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- Proofreading
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Albara Alomari:

- Editing
- Proofreading
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- Proofreading

- Validation

Ethics

Ethical concerns in the findings publication is on the privacy of the involved nurses and their site hospitals. Exposure of the nurses details risk their victimization by their respective hospital management. The findings are coded in manner that protects the identity of the nurses, thus insulating them from any potential victimization.

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