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ORIGINAL ARTICLE

Relationship between Work Ability Index and Fatigue among Iranian Critical Care Nurses

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ABSTRACT

Nurses have always been considered as a unique working group because of the physically and mentally demanding tasks they bear at work. Such a working condition exposes them to a high risk of fatigue, which could influence their work ability. Therefore, this study aims to investigate the relationship between work ability index (WAI) and fatigue of critical care nurses in a military hospital. In this descriptive and cross-sectional study, 101 nurses (71 females and 30 males) of critical care units filled out both the Persian version of WAI and nurses' fatigue questionnaires. The nurses were selected from three general hospitals of Tehran by cluster sampling method. The Pearson correlation test was used for investigating the relationship between two quantitative variables, and all the statistical analyses were performed by SPSS v. 21 software. The nurses' average age was 24.5 years old (±SD=±3.6), and the mean of work experience was 9 years (±SD=±4.13). The mean work ability of the nurses was 40.01 (±SD=±4.05), indicating "good work ability". Fatigue was found in 46.19% of the participants, and the nurses' fatigue was mainly of mental type (29.8%). There was a significant negative correlation (-0.57) between the scores of WAI and total fatigue ($p < 0.001$). The negative correlation between WAI and fatigue shows that WAI and fatigue score could be a good predictor of health and quality of work life. Identifying the influential factors of nurses' work ability and fatigue would help to improve the work condition of critical care nurses.

KEYWORDS: *Ergonomics, Fatigue, Nursing Work ability*

INTRODUCTION

Among health care workers, nurses have always been considered as a unique working group because of the significant physically- and mentally-demanding tasks. Nurses encounter various work stressors, such as high mental and physical job demands, shift work, unusual work hours, and lack of sufficient workforce to perform tasks, which differ by units or even regions [1-2]. Among hospital nurses, those working in the critical care unit, including the Intensive Care Unit (ICU) and Coronary Care Units (CCU), suffer from higher levels of stress and health-related problems due to their excessive workload [3-5]. The consequences of such work stressors are fatigue of workers, which affects their quality of work and life [6-8]. It seems logical that fatigue may decrease workers' working ability, but there is a gap in the literature addressing this interrelationship. In recent years, the work ability issue has been emphasized more because by losing work ability, productivity is reduced and it leads to the early retirement of workers [9]. In other words, improving work ability is associated with decreasing disability and premature retirement of workers [10]. Work ability describes capacities and capabilities of people concerning physical, psychological, and social needs of work in such a way that they can adapt physically or mentally to their job requirements based on their level of health [11].

There are extensive studies conducted about the work ability in many professionals that show the impairment of WAI. Rostamabadi et al. reported that the work ability of nurses in Iranian ICUsis at a good level, and the results of another study in a military hospital showed the same level of work ability [12-13]. In another study in an

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Iranian military hospital, it was shown that about 40% of the nurses had inadequate WAI [13]. Vasconcelos et al. found that most of the population under study suffered from reduced work ability and high levels of fatigue [14].

Fatigue is prevalent and it remains the main complaint among the hospital nurses [15]. Fatigue is defined as a feeling of tiredness due to excessive physical and mental work [16]. Barker and Nussbaum, in a survey study (n =745), reported that 65 % of the hospital nurses experienced acute fatigue and 50 % experienced chronic fatigue [17]. However, fatigue in nursing is now understood to be a multidimensional issue due to the complex nature, and substantial consequences include increasing medication errors, and mortality, decreased quality of decision-making, increased work injuries, decreased productivity, poor health, and job dissatisfaction and turnover [18-19].

With regards to the concepts of work ability and fatigue, the inverse relationship between these two variables seems logical and there are many studies reporting the high levels of fatigue associated with low levels of work ability [14]. However, there is the limited research available on the relationship between these two variables, which needs further investigation.

Accordingly, considering the practical importance of work ability and fatigue as a predictor of workers' health status as well as lack of studies on the association between these variables among nurses, this study was performed to investigate the relationship between the work ability and fatigue of the nurses in the critical care units of three Iranian military hospitals. Therefore, it could take a step forward to identify the effects of environmental and working conditions on workers' health and productivity.

MATERIALS AND METHODS

The present cross-sectional study was conducted in three different large Iranian general hospitals under the supervision of Iranian military university. They were selected by a random cluster sampling method from the northwest, centre, and southeast of the city to generalize to the hospital units of the similar types across the country. Inclusion criteria for the clusters were being a military hospital or affiliated with a military medical university and having a separate ICU and CCU. The exclusion criteria included any hospitals beyond the selected geographic area and unwillingness of the hospital managers to participate in the study. The sample population was selected by census among all nurses of the critical care units including 58 ICU and 43 CCU nurses. In this study, the WAI questionnaire was used to determine the nurses' work ability index and their fatigue was measured by the nurses' fatigue scale questionnaire. The Institutional Ethics Committee of AJA University of Medical Sciences approved the study and all the participants signed the informed consent. They were assured that all the information would be confidential.

WAI Questionnaire: WAI questionnaire was developed by the Finnish Institute of Occupational Health (FIOH) to determine work ability individually. Following extensive statistical evaluations, this institute achieved a very good correlation between the items of the questionnaire. Besides, validity and reliability have been reported acceptable [20]. Moreover, the validity and reliability of the Persian version of the questionnaire were evaluated by Mazloumi et al. (2014) [21-22].

In this study, the Persian version of WAI questionnaire was used. This questionnaire comprises 7-item: current work ability (0-10 points), work ability in relation to demands of the job (2 sub items, 1-5 points), illnesses (1-7 points), impairment caused by diseases (1-6 points), sick leaves over the last year (1-5 points), personal prognosis of work ability 2 year from now (points 1, 4 and 7) and mental resources (1-4 points). According to FIOH classification, range of each subject is from 7 to 49. These scores can be classified in four groups of weak work ability (7-27), moderate work ability (28-36), good work ability (37-43) and excellent work ability (44-49) [13-23].

Nursing fatigue scale: The nursing fatigue questionnaire was designed and developed by Dashti et al. (2015) to measure chronic fatigue of the hospital nurses. The content, visual, and construct validity of the tool has been confirmed. The internal consistency and the Intra Class Correlation (ICC) were estimated at 0.93 and 97, respectively. The reliability test by Cronbach's alpha coefficient showed an acceptable level. This questionnaire has been used in various units of hospitals to measure nurses' fatigue. The tool consists of 21 questions by 5-point Likert scoring scale as "Completely Agree" (score 5), "I agree" (score 4), "I have no idea" (score 3), "I disagree" (score 2), and "I totally disagree" (score 1) that ranges from 21 to 105. Nurses fatigue questionnaire is assessed in three domains of fatigue, including "mental fatigue" 9 items, "emotional fatigue" 6 items, and "physical fatigue" 6 items. A higher score indicates greater fatigue of the nurse [4, 24-25].

Data Analysis: Descriptive statistics, including range, mean, and standard deviation, were used for descriptive data analysis. Pearson correlation test was used to show the correlation between the study variables. Normality of the data was approved by the Kolmogorov–Smirnov ($p > 0.05$) test. The

statistical analysis was performed using SPSS 22 software. The p-value of less than 0.05 was considered statistically significant.

RESULT

In this study, 101 nurses of the critical care units answered to the questionnaire. The lowest and highest work experiences were 8 and 17 years, respectively. The mean height and weight of the participants were 165.51 cm and 72.9 kg. Moreover, 66 % of the nurses were married. Table 1 shows the demographic characteristics of the participants by the unit. The scores of the nurses' WAI are presented in Table 2. The mean score of the nurses' WAI is 40.01 ± 4.05, and the maximum and minimum scores are 48 and 31, respectively. Based on the FIOH classification, the obtained mean score belongs to the "good work ability" level. The distribution of the nurses' WAI score is as poor (6 %), moderate (27%), good (44%), and excellent (22%). The third item of the WAI questionnaire determines the disease type, which affects the participant's work ability. Table 3 presents the disease type of the participants based on self and physician diagnosis. It was revealed that 51 participants are suffering from at least one type of disease. Fig. 1 shows the dimensions of the critical care nurses' fatigue in three levels of mental, emotional, and physical fatigue. As illustrated in the figure, the total score of fatigue among the participants is (46.19 ± 16.01).

Table 1. Demographic characteristics of the participants (n=101)

Variable		Coronary care unit	Intensive care unit
Gender	Male (n)	12	15
	Female (n)	31	43
	Total (n)	43	58
Age (year) ± SD		23.17 ± 2.1	26.56 ± 5.1
Height (cm) ± SD		170.12 ± 9.7	160.9 ± 4.8
Weight (kg) ± SD		60.23 ± 11.7	85.7 ± 12.3
Work experience (year) ± SD		8.17 ± 3.97	17.01 ± 4.3
Shift length	8-h(n)	8	0
	12-h(n)	25	30
	24-h(n)	15	23

Table 2. Mean and stan dard deviation of work ability questionnaire per each item (n=101)

	Items		Mean (SD)	Maximum
1	Current work ability		9 ± 2.05	10
2	Work ability in relation to the job demands	Mental	4.2 ± 1.6	5
		Physical	4.1 ± 1.6	5
3	Illnesses		3.8 ± 1.12	7
4	Impairment caused by diseases		5 ± 1.15	6
5	Sick leaves over the last year		4.5 ± 1.08	5
6	Prognosis of work ability in two years		6.5 ± 3.01	7
7	Work ability related to the mental needs		3 ± .85	4
*	Work ability index		40.01 ± 4.05	49

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The lowest level is related to emotional fatigue (12.39 ± 4.83) and the physical (13.97 ± 6.34) and mental fatigue (29.8 ± 8.34) respectively rank in the next places. The normality of the data was approved by Kolmogorov–Smirnov ($p > 0.05$). Table 4 shows a statistically significant negative association between WAI and the fatigue scale scores. The three dimensions of the fatigue scale are negatively correlated with the WAI total scores, and the highest correlation (-0.6) was found between the mental fatigue and work ability. A p-value of less than 0.05 was considered statistically significant.

DISCUSSION

This descriptive-analytical study was carried out quantitatively in order to evaluate the relationship between WAI and fatigue score in the critical care units of the hospitals. In this study, a negative correlation was found between the study variables. The mean score of the nurses' work ability was 40.01 ± 4.05. According to FIOH classification, this score belongs to the "good work ability" level. In addition, according to the descriptive analysis, 33% of the participants had inadequate work ability. In the study by Samady et al., the mean WAI score of the nurses who worked in an Iranian police hospital was higher (excellent work ability) than that of the current study while 36.9 % had inadequate work ability [13]. Given a large number of studies on work ability, a comparison between these studies is presented in Table 5. The mean WAI score of the critical care nurses at the Iranian military hospitals is higher than those in other countries, including Saudi Arabia and Taiwan. This may be due to the high physical fitness of the soldier nurses [26]. By focusing on the third item of the WAI questionnaire, it was found that 35 participants of 101 critical care nurses are suffering from musculoskeletal disorders. According to the US Department of Labor, there is a significant relationship between nursing turnover and musculoskeletal disorders and reduced productivity [32]; however, reduced productivity can be attributed to the environmental stressors, which affect nursing work ability in different ways. As discussed in the literature reviews, the optimal design of the work environment increases the productivity of employees as a result of the good work ability level [33].

Many studies have examined the relationship between work ability index and the variables of demographic characteristics, ethnicity, and diseases. Rostamabadi studied the effective factors on the work ability of Iranian ICU nurses and showed that high body mass index (BMI) had an inverse relationship with their work ability and 50% of those with musculoskeletal disorders had a lower work ability [12]. In another study, it was predicted that, as BMI cross over 25, the WAI is decreased by 2.2 scores [34].

High weight or obesity is associated with a wide range of cardiovascular and musculoskeletal disorders and the consequence of such conditions is work inability [35]. Moreover, many studies have proved the relationship between age and work ability.

Table 3. Number of the participants' current diseases in accordance whit the 3rd item of the WAI questionnaire (n=101)

Groups of Diseases	Self-diagnosis	Physician-diagnosis
Trauma	4	2
Musculoskeletal disease	35	30
Cardiovascular disease	2	1
Respiratory disease	0	0
Mental disorder	0	0
Neurological and sensory diseases	4	2
Digestive disease	10	9
Genitourinary disease	1	0
Skin disease	9	4
Endocrine and metabolic diseases	3	3
Blood diseases	0	0
Tumor	0	0
Total	68	51

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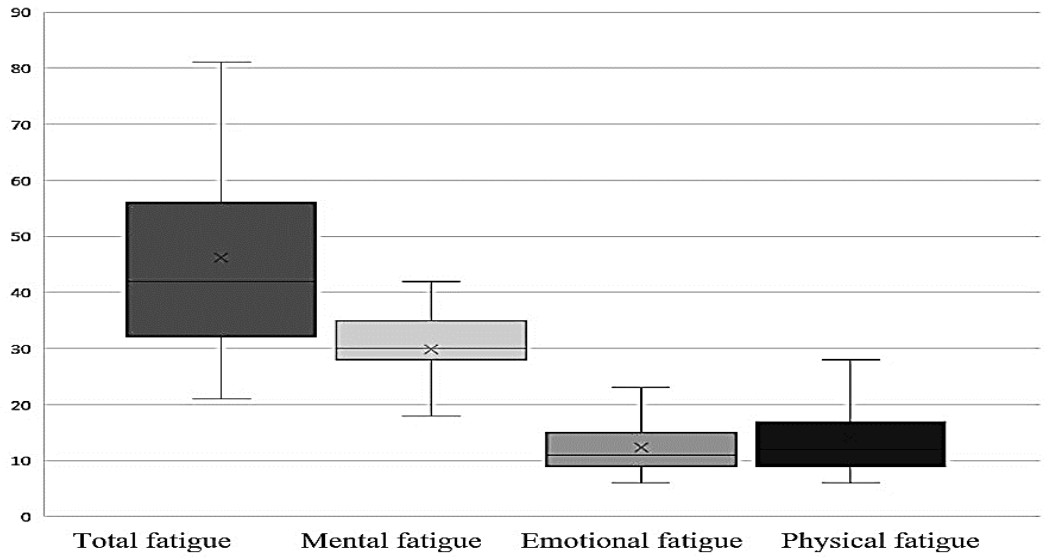

Fig. 1. Dimensions of the nurses' fatigue questionnaire

Table 4. Pearson correlation coefficient between the WAI and fatigue scores of the critical care nurses

Fatigue	WAI	P-value
Mental	-0.60	0.009
Emotional	-0.56	0.001
Physical	-0.55	0.001
Total	-0.57	0.001

Table 5. Comparison of the mean scores of work ability in different countries

Domain	Work ability (Mean ± SD)	Authors & Reference
Taiwanese nurses	38.4±4.4	Chiu et al., 2007 [26]
Nurses of Saudi Arabia, Jordan	29.3± 6.8	Heyam et al., 2018 [27]
ICU nurses, Iran	39.80 ±5	Rostamabadi et al., 2017 [12]
Nurses of Iranian teaching hospital	36.9 ±4.4	Abbasi et al., 2016 [28]
Nurses of the Police Hospital of Iran	45.24±6.23	Samadi and Golmohammadi, 2013 [13]
Petrochemical industries in Iran	39.1±5.7	Mazloumi et al., 2012 [29]
Brazilian students	41.4 ±5	Marqueze et al., 2008 [30]
Bus drivers in Asturias (Europe)	36.8	Kloimüller et al., 2000 [31]

As age increases, functional abilities decrease; as a result, the work ability diminishes [36-37]. Comparing men and women, work ability in men is more than women, however; as women approach menopause, the difference between men and women is reduced [38-39]. The mean score of fatigue in the participant was 46.19, and the highest score was related to mental fatigue. In this regard, Silva et al. showed that 52 % of the nurses at the inpatient wards of a public teaching hospital reported fatigue [6]. The result of the current study is in line with the study conducted by Dashti et al. [4]. Many factors could affect nurses' fatigue, which may attribute to their mentally and

physically demanding job [2, 40]. Time pressure, the number of patients under care, patient transfer, and shift work are considered as the characteristics of critical nurses tasks that increase nurses' workload and lead to fatigue and burnout among them [41-42]. Based on the permanent disability model, these factors were confirmed to be important risk factors for the development of musculoskeletal disorders [43]. Additionally, it was revealed that the need for the recovery in the Iranian workforce is high, which indicates high levels of fatigue among them [44]. Table 4 shows that the total score and three dimensions of the nurses' fatigue are in a significant negative correlation with the WAI score. Therefore, any variations in the fatigue or WAI score affect the other dimensions. Silva et al. found a negative correlation (-0.46) between WAI and fatigue that is in accordance with the current study [6]. In another study in an industrial factory, a significant negative correlation was found between WAI and fatigue score, which is in line with the result of the current study [45]. Some work system stressors could influence both work ability and fatigue among nurses. According to Vasconcelos et al., most of the studied population suffered from reduced work ability and high levels of fatigue [15]. Moreover, in the study by Samadi et al., it was explored that, nursing job stressors, such as inappropriate expectations (-0.26), time constraints, response to patient families (-0.24), and shift work (-0.38) had a negative correlation with nursing work ability [13], which could influence the nurses' fatigue.

CONCLUSION

The average score of nurses' work ability in the critical care units of the selected Iranian hospitals was in a good range and negatively correlated with their fatigue score. This negative correlation is independent of other variables. Hence, there is an obvious need to invest in the quality of work life and identify its factors, which affect nurses' work ability and fatigue by improving their work conditions and monitoring their health status.

Limitations: The current study was conducted with a cross-sectional design. Therefore, it was impossible to determine the causal relationships between the variables. Considering more than three hospitals and the requirement of more participants may lead to more robust results. Moreover, in this study, only subjective tools were used. Although, using objective methods associate with questionnaires could enhance the validity of the results.

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