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A Survey of Shift Work and Work Ability Index among Nurses: A Case Study in Educational Hospital, Ahvaz, Iran

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ABSTRACT

Shift work is a social phenomenon with adverse effects on the lives and health of people in various aspects. This adverse effect decreases shift workers' ability over a time period. The aim of the present study was to survey disturbances due to shift work and some disorders associated with work ability index among nurses in educational hospitals, Ahvaz, Iran. This cross-sectional survey was conducted among 33 nurses at the Golestan Hospital, Ahvaz, Iran. The survey of shift workers questionnaire (SOS) and the Work Ability Index (WAI) questionnaire was used as data collection tools. The related data was analyzed based on the descriptive statistics, Pearson correlation test, and Spearman correlation test using IBM SPSS software version 19. The results showed that 97% of problems related to the effects of shift work on the individuals' lives, families, and musculoskeletal disorders, 87.9% related to insomnia and social problems, and 75.8% related to mental disorders. Although it showed a significant relationship between the workability index with the variable of experience and mental disorders, it showed no significant relationship between the prevalence of insomnia and musculoskeletal disorders variables. The results of this study showed that shift working disrupts mental, social, and physical health that ultimately adversely affect the ability of shift workers. Therefore, it was recommended to adjust working hours and allocate the appropriate shifts to improve the workability of individuals.

KEYWORDS: *Shift Work, Work Ability Index, Nurses*

INTRODUCTION

Shift work refers to a work schedule that is performed outside of the working day framework (from 7 am to 6 pm). Although this way of working is not new in the past few centuries, over the past decade along with the growth of the industry has enjoyed a remarkable expansion. Economic pressures, requirements for industrial processes, and the need for some services all 24 hours of the clock each day of the week (often abbreviated as 24/7) are some of the reasons that have led to work shifts [1]. According to the results of previous studies, the prevalence of shift work in European countries is reported to be 15% to 20% percent and 20% in America [2]. Regardless of

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this social phenomenon's effect on achievements of technological progress, it can affect human life and their health in various aspects [3]. Shift work chronic effects [4] are mainly identified by abnormalities in physiological processes like a sleep-wake cycle, weakened physical and physiological health, problems of consciousness, function, safety, family, and social problems [5]. Chronic effects of shift work increase the risk of neuron-psychiatric, cardiovascular, and gastrointestinal disease [6].

Night shift causes disruption in biological rhythms to a large extent [7]. Based on the epidemiological studies, disruption of biological cycles associated with night shift work causes various diseases such as gastrointestinal disorders, cardiovascular, and musculoskeletal [8-9].

Nurses should provide service in rotation all 24 hours of the clock each day of the week. For those who take turns in work, night shifts caused unfavourable consequences on their natural life which most of them are uncontrollable [10-11].

Night shift increases insomnia risk among nurses [5]. These disordered patterns of sleep-wakefulness reduce their job performance [12]. In a study conducted by Gustafsson in 2002 on the quality of sleep and health of 160 female nurses, 45% of the nurses suffered from insufficient sleep, 30% suffered from digestive problems, and 62% suffered from back pain and joint pain [13]. Suwazono et al. investigated the impact of night shift work in a steel factory during a period of 14 years on shift workers, they concluded that shift working is an independent cause for high blood pressure [14].

Thus, it can be concluded that shift work has adverse consequences for the individual and lead to dissatisfying them with their work. As a result, absence from work and changing the job would be inevitable and could reduce the number of experienced personnel in nursing systems [15]. Thus, the results of previous studies showed that about 7.4% of the nurses would be absent every week due to exhaustion and mental problems which was 80% more than other jobs [16]. Therefore, improving workability index has been proposed to be the most promising option to prevent work disability and work leaving in the recent years.

Workability is an important and complex concept in occupational health research and practice that can be evaluated using WAI index. This index is a set of factors that enables a person to do job requirements in a best way in certain circumstances [17]. This assessment indicators in nursing as one of the main components of the healthcare system remain very important and considered by researchers [18]. Numerous studies have focused on measuring these factors and the factors influencing its job [19]. For example, the outcomes of a study conducted in 2012 in Brazil concluded that the average index of 39.3% of nurses was at a good level and negatively correlated with age [20]. Another study in Croatia in 2009 showed that there was a negative relationship between the WAI and the organization of work and financial issues, low level of education, and nurses' age [21].

Nurses' physical and mental health has a great impact on how to deliver effective health services. However, irregular working shift hours adversely affect the physical, mental, individual and social life performance and efficiency of nurses [22]. Hence, this stress and its effects put nurses at risk of disability and premature exit from the workplace over time. Therefore, the current survey was aimed to evaluate some of these disorders and its association with shift work and workability index.

MATERIALS AND METHODS

The present survey was a cross-sectional survey consisted of 33 nurses working at the Golestan Hospital, Ahvaz, Iran. Inclusion criteria were at least one year working experience in relevant part, bachelor's degree or higher, and inclination for research. The Survey of Shift Worker (SOS) questionnaire and Work Ability Index (WAI) questionnaires were used for collecting the data.

The effects of shift work data was collected via SOS questionnaire. This questionnaire assesses the effects of shift working on nurses' health using questions about demographic variables of nurses and personal, social, and family life satisfaction among shift nurses. So, this questionnaire was designed to collect data on musculoskeletal pain, health status, information about a job, mental health status, sleep patterns of shift workers, and work shift systems. The SOS questionnaire includes 49 questions for shift working nurses. The questionnaire included 49 questions about demographic characteristics and cardiovascular symptoms, digestive symptoms, musculoskeletal pain, general health, chronic fatigue,

social and domestic disturbance, sleep disturbance, and neuroticism. The validity and reliability of the SOS questionnaire were assessed in Iran [23]. The internal consistency coefficients for the SOS questionnaire was equal to 0.81[23].

The second survey is the work ability index (WAI) qquestionnaire that has been developed by Finnish researchers consists of seven sections (see Table 1). The best possible estimate of the WAI index is 49 and the worst rating is 7. Finally, based on points obtained, the ability to work can be classified into four levels of weak (27-7), medium (28-36), good (44-37) excellent (49-45) [24]. This questionnaire has been widely used in various studies and it had a sufficient validity and reliability [25-27]. The collected data was analysed by descriptive statistics, Pearson, and Spearman correlation tests using SPSS software version 19.

Table 1. Options studied in the Work Ability Index questionnaire

Questionnaire of Work Ability Index	Score	Explanation
The current work ability compared with the best time of life	1-10	0=very poor 10= excellent
Ability in relation to the nature of the job (physical, psychological)	2-10	2=Very Poor 10=Excellent
Current diseases diagnosed by a physician	1-10	1-5≤ illness, 2.4 disease, 3.3 disease, 4.2 disease, 5-1 disease, 7. absence of disease
Individual estimates of disruptions in work due to illness	1-6	1= The maximum ability and disability, 6= no impact on job
Sick leave during the past 12 months.	1-5	1-100 days and more, from 2.99 to 25 days, day 3-24-10, 4-9-1 days, 5-0 days
Prediction of the ability to work over next two years	1,4,7	1-unlikely, 4-unsure, 7-almost sure
Mental capabilities	1-4	1-Very Poor, 4-High

RESULTS

A total of 33 questionnaires were selected among 40 distributed questionnaires. Due to inclusions criteria such as a minimum of one year shift working experience and incomplete questionnaire, 7 questionnaires were excluded from the study. The age mean of the participants was 35.06 ± 6.309 years old. The duration of work and shift work mean was 1015 ± 5.34 hours. Marital status of the participants showed that 60.6% of nurses were married and 39.4% of them were single. Table 2 shows the frequency and the amount of disruption caused by shift working among shift workers.

Table 2. Distribution of disorders related to shift work

Digestive	57.6
	27.3
Cardiovascular	97
	75.8
Musculoskeletal	87.9
Mental	87.9
Suffering from insomnia	97
Adverse effect on social life	97
Adverse impact on family life	
Adverse effect on an individual's life	

Nurses' work ability index distribution scores and the related classification has been presented in Table 3. As can be seen, the highest percentage of distribution was calculated good in the category of medium-sized distribution with a score of 66.7% and 18.2%.

The WAI index relationship with other variables was assessed by Pearson and Spearman correlation.

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Table 3. Work Ability Index (WAIT) in nurses

Weak	15.2
Average	66.7
Good	18.2
Excellent	

- There was a significant relationship between the work ability index and nurses' work experience (P=0.000). On the other hand, the correlation between the two variables was -0.798, therefore, there was a significant inverse relationship between two WAI and work experience due to the negative rates.
- There was no significant relationship between WAI and suffering insomnia (p=0.094).
- There was a significant relationship between the work ability index and mental disorders (p=0.000). On the other hand, the correlation between the two variables were -0.637. Thus, there was a significant inverse relationship between two variables of WAI and psychological disorders due to the negative correlation between two variables.

There was no significant relationship between WAI and musculoskeletal pain (p=0.325).

DISCUSSION

This study was aimed to determine problems caused by shift working and the relationship between disorders associated with the work ability index at the Golestan hospital in Ahvaz, Iran. In the present study, based on the objectives of the study and due to some limitations and the impossibility of further sampling, the current results were accessible.

The results of the analysis of the shift working questionnaires showed that problems caused by shift working were highly prevalent among nurses. The highest prevalence were related to problems in personal life, family, and musculoskeletal disorders by 97%, social problems and suffering insomnia with 87.9%, and mental and psychological problems with 75.8%. Due to the working system differences in each institution, problems caused by shift working also varied among the different organizations. It is due to this difference that the results of various studies conducted on the prevalence of nurses' shift working problem showed different outcomes. For example, Alireza Khammar et al. investigated shift working disorders among nurses, the results showed the most frequent problems among the subjects were psychological disorders (95%), digestive problems (85%) and social problems (80%) [28].

In another study by M. Kangavar et al. proved that the highest prevalence of problems was related to social life (86%), psychological disorder (74%), and sleeping problems (63%) [29]. Therefore, it can be concluded that the shift working has a considerable impact on nurses' working and family life. These results were similar to the results of an evidence-based study conducted by Arlinghaus et al. to investigate the effects of shift work and non-standard working hours on workers, family, and community [30]. The difference in results of the studies would be due to differences in environment, organization, culture, the number of hours worked per week, employment status, and education level of the work environment in communities [28].

The results of the WAI showed that 18.2% of nurses had a good WAI, 66.7% moderate and 15.2% weak.

The relationship between the work ability index and years of practice showed that increasing experience was correlated to the decline of the WAI index. Several studies also have proven the relationship between the low ability to work and high experience [31-33]. However, there was a negative correlation between the work ability index and psychological disorders. Kenneth J et al. showed that

there was a significant inverse relationship between the work ability index with job stresses which was a mental disorder and can lead to Burnout [25]. In the present study, the work ability index and the prevalence of insomnia and musculoskeletal disorders had no significant correlation. On the contrary, some studies showed a significant correlation between this index, sleep, and musculoskeletal pain [34-35].

CONCLUSIONS

From the sample size point of view, our cross-sectional study included a limited number of the participants. Therefore, in the present study, only nurses who were working during the study participated in our research. So, it would be interesting to investigate other hospitals with a larger sample size and add more health statue index.

The results of WAI showed that 66.7% of nurses were at intermediate level considering WAI. Hence, extra efforts should be considered by managers and the relevant authorities to improve these indicators. In order to improve nurses' sleep quality, to prevent the work ability index decrease and the incidence of complications and disorders, it is recommended to adjust working hours and shift working schedules.

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CONFLICTING INTEREST

The authors declare that they have no competing interest.

ETHICAL CONSIDERATIONS

This study was approved by the Ethics Committee of Ahvaz Jundishapur University of Medical Sciences (IR.AJUMS.REC.1399.719). Obtaining informed consents, explaining the nature, method, and purpose of the research to patients and performing the study in accordance with the observing the principle of secrecy and confidentiality of the data and freedom of the research participants to leave the study were the ethical principles observed in this research.

REFERENCES

1. Patterson PD, Mountz KA, Budd CT, Bubb JL, Hsin AU, Weaver MD, Turner RL, Platt TE, Guyette FX, Martin-Gill C, Buysse DJ. Impact of shift work on blood pressure among emergency medical services clinicians and related shift workers: A systematic review and meta-analysis. Sleep Health. 2020 Apr 28.
2. Du HB, Bin KY, Liu WH, Yang FS. Shift work, night work, and the risk of prostate cancer: A meta-analysis based on 9 cohort studies. Medicine. 2017 Nov; 96(46).
3. Akerstedt T, Kecklund G. The future of work hours--the European view. Ind Health 2005; 43(1): 80-4.
4. Wang XS, Armstrong ME, Cairns BJ, Key TJ, Travis RC. Shift work and chronic disease: the epidemiological evidence. Occupational medicine. 2011 Mar 1; 61(2):78-89.
5. Flo E, Pallesen S, Magerøy N, Moen BE, Grønli J, Nordhus IH, et al. Shift work disorder in nurses–assessment, prevalence and related health problems. PloS one. 2012; 7(4): e33981.
6. Bleetman A, Sanusi S, Dale T, Brace S. Human factors and error prevention in emergency medicine. Emergency Medicine Journal. 2012; 29(5): 389-93.
7. Bohle P. Does 'hardiness' predict adaptation to shiftwork? Work & Stress. 1997; 11(4): 369-76.
8. Freese M, Okenek: Reasons to leave shift work and psychosomatic complain of shift workers. J Appl Psychol. 1984; 69(3): 509-514.
9. Demerouti E, Bakker AB, Bulters AJ. The loss spiral of work pressure, work-home interference and exhaustion: reciprocal relations in a three-wave study. J. Vocat.Behav. 2004 Feb; 64 (1): 131-49.
10. Ferri P, Guadi M, Marcheselli L, Balduzzi S, Magnani D, Di Lorenzo R. The impact of shift work on the psychological and physical health of nurses in a general hospital: a comparison between rotating night shifts and day shifts. Risk management and healthcare policy. 2016; 9:203.
11. Flo E, Pallesen S, Magerøy N, Moen BE, Grønli J, Hilde Nordhus I, Bjorvatn B. Shift work disorder in nurses–assessment, prevalence and related health problems. PloS one. 2012 Apr 2; 7(4):e33981.
12. Di Muzio M, Diella G, Di Simone E, Novelli L, Alfonsi V, Scarpelli S, Annarumma L, Salfi F, Pazzaglia M, Giannini AM, De Gennaro L. Nurses and Night Shifts: Poor sleep quality exacerbates psychomotor performance. Frontiers in Neuroscience. 2020 Oct 14; 14:1050.
13. Gustafsson E. Self-reported sleep quality in females. J Caring Sci; 2002. 16(2): 179 – 187.
14. Suwazono Y, Dochi M, Sakata K, Okubo Y, Oishi M, Tanaka K, et al. Shift work is a risk factor for increased blood pressure in Japanese men: a 14- year historical cohort study Hypertension. 2008; 52: 581-6.
15. Lai HL, Lin YP, Chang HK, Wang SC, Liu YL, Lee HC, and Peng TC, Chang FM. Intensive care unit staff nurses: predicting factors for career decisions. Journal of clinical nursing. 2008 Jul; 17(14):1886-96.
16. Gander P, O'Keeffe K, Santos-Fernandez E, and Huntington a, Walker L, Willis J. Fatigue and nurses' work patterns: An online questionnaire survey. International Journal of Nursing Studies. 2019 Oct 1; 98:67-74.
17. Smrekar M, Franko A, Petrak O, Zaletel-Kragelj L. Validation of the Croatian Version of Work Ability Index (WAI) in Population of Nurses on Transformed Item-Specific Scores. Slovenian Journal of Public Health. 2020 Apr 6; 59(2):57-64.
18. Ebener M, Hasselhorn HM. Validation of short measures of work ability for research and employee surveys. International journal of environmental research and public health. 2019 Jan; 16(18):3386.
19. Smrekar M, Franko A, Petrak O, Zaletel-Kragelj L. Validation of the Croatian Version of Work Ability Index (WAI) in Population of Nurses on Transformed Item-Specific Scores. Slovenian Journal of Public Health. 2020 Apr 6; 59(2):57-64.
20. Monteiro I, de santana Pi Chillida M, Moreno LC. Work ability among nursing personnel in public hospitals and health centers in Campinas–

21. Brazil. Work. 2012 Jan 1; 41(Supplement 1):316-9.
22. Golubic R, Milosevic M, Knezevic B, Mustajbegovic J. Work-related stress, education and work ability among hospital nurses. Journal of advanced nursing. 2009 Oct; 65(10):2056-66.
23. Suter J, Kowalski T, Anaya-Montes M, Chalkley M, Jacobs R, Rodriguez-Santana I. The impact of moving to a 12h shift pattern on employee wellbeing: A qualitative study in an acute mental health setting. International Journal of Nursing Studies. 2020 Jul 9:103699.
24. Choobineh A, Soltanzadeh A, Tabatabaie SH, Jahangiri M. Shift work and its related health problems in petrochemical industries. Journal of School of Public Health and Institute of Public Health Research. 2012 Mar 10; 9(4):43-56.
25. Tuomi K, Ilmarinen J, Jahkola A, Katajarinne L, Tulkki A. Work ability index. Helsinki: Finnish Institute of Occupational Health; 1998 Dec.
26. Abdolalizadeh M, Arastoo AA, Ghsemzadeh R, Montazeri A, Ahmadi K, Azizi A. The psychometric properties of an Iranian translation of the Work Ability Index (WAI) questionnaire. Journal of occupational rehabilitation. 2012 Sep; 22(3):401-8.
27. Mazloumi A, Kazemi Z, Eivazlou M. Validation and reliability study of farsi version of work ability index questionnaire. Journal of School of Public Health and Institute of Public Health Research. 2014 May 10; 12(1):61-74.
28. Arastoo AA, Montazeri A, Abdolalizadeh M, Ghasemzadeh R, Ahmadi K, Azizi A. Psychometric properties of Persian version of the Work Ability Index questionnaire. Payesh (Health Monitor). 2013 Oct 15; 12(5):535-43.
29. Khammar A, NabiAmjad R, Marioryad H, Ghosheh SN, Alimohammadi M, Abbasi M, Poursadeqiyan M. Shift working disorders among nurses of Tehran hospital and its related factors in 2016. Work. 2020 May 11(Preprint):1-7.
30. Kangavari M, Saranjam B, Mohammadpour H, Ranjbarian M, Teimori G, Mehri A. Investigating Prevalence and Factors Associated with ShiftWork Disorder in Nurses of Selected Hospitals of Shahid Beheshti University of Medical Sciences in 2014. J Occupational and Environmental Health. 2016; (1)1: 50-57.
31. Arlinghaus A, Bohle P, Iskra-Golec I, Jansen N, Jay S, Rotenberg L. Working Time Society consensus statements: Evidence-based effects of shift work and non-standard working hours on workers, family and community. Industrial health. 2019; 57(2):184-200.
32. Rypicz Ł, Witczak I, Rosińczuk J, Karniej P, Kołcz A. Factors Affecting Work Ability Index Among Polish Nurses Working in Hospitals–A Prospective Observational Survey. Journal of Nursing Management. 2020 Oct 23.
33. Somunen E, Remes J, Hassi J. Factors Associated with Self-estimated work ability and Musculoskeletal Symptoms among Male and Female Workers in Cooled Food-Processing Facilities. Industrial Health 2009; 47:271-282.
34. Jay K, Friborg MK, Sjøgaard G, Jakobsen MD, Sundstrup E, Brandt M, Andersen LL. The consequence of combined pain and stress on work ability in female laboratory technicians: a cross-sectional study. International journal of environmental research and public health. 2015 Dec; 12(12):15834-42.
35. Holm LW, Bohman T, Lekander M, Magnusson C, Skillgate E. Risk of transition from occasional neck/back pain to long-duration activity limiting neck/back pain: a cohort study on the influence of poor work ability and sleep disturbances in the working population in Stockholm County. BMJ Open. 2020 Jun 1; 10 (6):e033946.
36. Mazloumi A, Rostamabadi A, Saraji JN, Foroushani AR. Work ability index (WAI) and its association with psychosocial factors in one of the petrochemical industries in Iran. Journal of occupational health. 2012:1202130234-.