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Shift Work and Related Health Problems among Medical and Diagnostic Staff of the General Teaching Hospitals Affiliated to Shiraz University of Medical Sciences, 2012

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ABSTRACT

Introduction: Today, shift work is considered as a necessity in many jobs and for some 24-hour services the use of shift-work is growing. However, shift work can lead to physiological and psycho-social problems for shift workers. This study aimed to determine the effects of shift work on the associated health problems, together with the demographic and job characteristics underlying the problems, among the medical and diagnostic staff of the general teaching hospitals affiliated to Shiraz University of Medical Sciences in 2012.

Method: This study was an applied, cross-sectional and descriptive-analytical one. The study employed a sample of 205 employees from the medical and diagnostic staff using stratified sampling proportional to the size and simple random sampling methods. Data were collected using the Survey of Shift workers (SOS) questionnaire, validity and reliability of which have already been confirmed. Finally, the collected data were analyzed using SPSS 16.0 software through ANOVA, Chi-square, Independent-Samples T-Test, as well as Pearson Correlation Coefficient. A $P<0.05$ was considered statistically significant.

Results: The results showed that among the demographic and job characteristics studied, the individual, family and social problems had significant associations with work schedules, shift work and job satisfaction. In addition, there were significant associations between musculoskeletal disorders and the satisfaction of shift work; cardiovascular disorders and marital status and occupation; digestive disorders and the work schedules; sleep disorders and the satisfaction of shift work; musculoskeletal disorders, cardiovascular disorders and sleep disorders and age, job experience and shift work experience. And finally, there were significant associations among sleep disorders and age, job experience and the shift work experience.

Conclusion: Based on the findings of this study, demographic characteristics such as age, marital status, as well as job characteristics can increase the individual, family and social problems, and cardiovascular, musculoskeletal, digestive and sleep disorders. Therefore, in order to reduce these problems and disorders, the following suggestions are made: allowing voluntary shifts for the staff, shortening the hours of night work, limiting the employment of older people in the shift work systems, etc.

Keywords: Shift work, Health problems, Clinical and diagnostic staff

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Introduction

With the advent of the industrial revolution and the advancement of science and technology, human society has evolved, leading to the establishment of new laws and regulations. The invention of artificial light sources has changed the face of human life, making the night as important as the day. Therefore, the 24-hour society emerged and the shift work phenomenon was introduced in order to increase the efficiency of labor (1).This is regarded as a necessity in many jobs (2-4). Since the 1970s, shift work in America and Western Europe has made up a large percentage of the total workforce (5) and this figure is rising (2, 4, 6-10), so that, today, in Europe and the United States, shift work and irregular working hours have become the rule rather than the exception. The findings of numerous studies show that at present only about 25 percentof the work force in Europe have regular day jobs (11). In Iran, like many developing countries, because of expanding industries, the increasing need to produce more and provide 24-hour services, shift work is rapidly expanding. However, accurate statistics on the exact number of employees working in unconventional times is not available (12). In addition to the manufacturing and industrial sectors, in the service sectors, particularly in the fields of military, police, medical and nursing, shift

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work also has a long-standing history, so that the manpower working in these sectors is usually ready for the delivery of the 24-hour services (13). However, in the health sector, the proportion of employees who are working in the night shifts is higher (14).

Shift work is defined as scheduling work shifts outside the normal working hours during the day (8, 15). This term typically involves long night shifts and the schedules in which the work hours of the employees change in different shifts and shifts are in rotation (2-4). Shift work can be done in several ways. Overall, there are two types of shift work, including the three eight-hour shift work per day and the two12-hour shift work per day, but with the advantage of a lower number of working days and more holidays (16, 17).

When most workers are shift workers, it is important to study the shift work effects on health (11). Although shift work and night work are inevitable achievements of the technology and belong to the 24-hour society worldwide (5, 18), those who are engaged in these kinds of job have faced certain problems (19). Problems occur when a person is unable to properly adapt his/her body's internal clock to the work schedule (20). Generally speaking, its adverse effects can be chronic (21) and can be categorized into two main groups: physiologic and psychosocial ones (10, 14, 22, 23).

The physiologic effects include impairment of physiological processes, deterioration of the physical and psychological health, and loss of one's alertness and vigilance (24). It has also been proved that the body has a mechanism to regulate its circadian rhythm. Circadian rhythm is mainly found in food and sleep patterns, as well as body's temperature and level of functioning, brain wave activity, hormone production and other biological activities. And it is noticed that changes in circadian rhythm impair these patterns (3, 4, 15, 25-28). Night shift work alters one's exposure to normal light time and disrupts this rhythm (3, 4, 8, 28, 29).Therefore, shift work is known as a risk factor for many health problems (3, 4). Various studies, carried out on the effects of shift work on health, have reported statistically significant associations between the shift work, especially long night shifts, and health problems such as cardiovascular disorders, metabolic disorders like type 2 diabetes and metabolic syndrome, high blood pressure, gastrointestinal disorders, stomach problems and ulcers, rheumatoid arthritis, back and neck pain, cancers, breast cancer in particular, and abortion (2-4, 6-9, 11, 23, 25-45).

Concerning the psychosocial effects of shift work, the results of studies have shown that shift work can impair one's behavioral and mental health (2, 11, 22, 26, 42). In this regard, mental and behavioral disorders or sleep disorders, job stress, depression and anxiety and affective disorders have been reported to be prevalent among shift workers (2, 3, 8, 11, 12, 22, 26-30, 33, 35-39, 42, 44, 46, 47).The results of several surveys have shown that shift workers, compared with day workers with a regular schedule, even in retirement, are more likely to suffer from poor sleep (4, 8, 12, 26, 46, 47).Therefore, night shift, with resulting negative effects on hours of sleep and daytime sleepiness and fatigue, is observed to decrease the performance and increase the risk of accidents (3, 29, 41, 44, 48-51). Owing to sleep disorders, the shift workers are more prone to making mistakes, especially in the early morning hours (29).

In addition, shift working is demonstrated to put adverse effects on the employees' family and social life (6, 25, 28, 49). However, these effects can vary among shift workers extensively.

A weak work schedule administered in the health care systems, as one of the oldest and most important systems involving shift works (25, 29, 52), would adversely affect the quality of care provided, productivity, patient satisfaction, and length of stay. In addition, work absenteeism is found more prevalent among shift workers (51, 52). However, to the best of our knowledge, few studies have been performed investigating the effects of shift work, as well as demographic and job characteristics adversely affecting the health of the shift workers working in the health care systems using a valid and comprehensive tool. Therefore, this study aimed to determine the effects of shift work on the associated health problems, together with the demographic and job characteristics underlying the problems, among the medical and diagnostic staff of the general teaching hospitals affiliated to Shiraz University of Medical Sciences in 2012.

Methods

This study is an applied, cross-sectional and descriptive-analytical one conducted in the general hospitals affiliated to Shiraz University of Medical Sciences in 2012. The study population consisted of all the medical and treatment staff, including general physicians, nurses, operating room staff, as well as laboratory, radiology and physical therapy personnel (N=2000). A sample of 200 employees was determined based on the results of the pilot study and the following formula, assuming α= 0.05, d= 0.065 and p=q=0.5. Finally, with regard to the possibility of loss and lack of response to the questionnaire by some employees, a sample of 205 employees was determined. This sample was selected as follows: first, each of two studied hospitals was considered as a stratum. Then, the determined sample was selected in these hospitals according to the number of their medical and diagnostic personnel using stratified sampling proportional to the size and simple random sampling methods using random numbers table.

$$n = \frac{Npqz^2_{1-\frac{\alpha}{2}}}{pqz^2_{1-\frac{\alpha}{2}}+(N-1)d^2}$$

The required data was collected using Survey of Shift workers (SOS) questionnaire developed by the Economic and Social Research Council (ESRC) and Medical Research Council (MRC) In the UK. The questionnaire is considered as one of the most complete questionnaires regarding the problems associated with shift work (21).It consisted of 54 questions over demographic and personal characteristics(10 items), features of shift work (12

items), gastrointestinal disorders (1 item), cardiovascular disorders (5 items), mental disorders (5 items), sleep disorders (13 items), musculoskeletal disorders in various organs and limbs (4 items), adverse effects of shift work on individual activities (1 item), negative effects of shift work on family activities (2 items), and adverse effects of shift work on social life (1 item).

The validity and reliability of this questionnaire had been confirmed in previous studies conducted by Choobineh and his colleagues (2012) (Cronbach's alpha=0.81) (41).

Also, demographic characteristics of the staff, including age, sex, marital status, education level, job experience, shift work experience, occupation, employment status and their job characteristics such as shift work system, occupation, type of shift rotation, voluntary shift selection, satisfaction of shift work, and so on were asked and the associations between these characteristics and shift work problems were investigated.

Informed consent was obtained from all employees participating in this study and all of them were assured of the confidentiality of their responses .Finally, the collected data was analyzed using SPSS 16.0 software through ANOVA, Chi-square, Independent-Samples T-Test, as well as Pearson Correlation Coefficient. A $P<0.05$ was considered statistically significant.

Results

The results showed that most of the employees were females (71.7%), married (52.7%), nurses (64.9%), working through contracts (50.7%), and having bachelor's degrees (62.9%). In this study, the means of age, job experience and shift work experience of the participants were 30±6.8, 7.16±0.83, and 6.8±0.34 years, respectively (Table 1).

Also, most of the participants were shift workers (85.4%) with a regular shift rotation (44.4%) whose shift hours were obligatory (67.3%), and were satisfied with the shift work (53.2%) (Table 2).

Furthermore, the results showed that among those reporting digestive disorders, shift work employees complained more of the stomach pain and heartburn (28.98%). Tiredness during the day was also the most prevalent problem among the shift work employees with mental disorders. (27.08%)(Table 3).

Concerning their sleep hours, the employees stated, on average they needed 8.3± 1.23 hours of sleep per day. Based on the information obtained, the difference between the amount of sleep the personnel needed and their current sleep was two hours.

Table 1. The main topic and sub-topic of the relationship between hospitals and insurance organizations

Variables		Frequency (%)	Variables		Frequency (%)
Sex	Male	58 (28.3)	Employment Status	Official Employees	50 (24.7)
	Female	147 (71.7)		Contract Employees	104 (50.7)
	Total	205 (100)		Treaty Employees	14 (6.8)
Marital Status	Single	97 (47.3)		Temporary Employed Employees	37 (18)
	Married	108 (52.7)		Total	205 (100)
	Total	205 (100)	Occupation	Nurses	133 (64.9)
Education Level	Lower than Bachelor's Degrees	62 (30.2)		General Physicians	10 (4.9)
	Bachelor's Degrees	129 (62.9)		Diagnostic Personnel	38 (18.5)
	Master's Degrees	14 (6.9)		Operating Room Staff	24 (11.79)
	Total	205 (100)		Total	205 (100)

Table 2. Job characteristics of the studied employees

Variables		Frequency (%)	Variables		Frequency (%)
Work Schedule	Daytime work (Morning shift)	30 (14.6)	Shift Selection	Voluntarily	42 (20.5)
	Shift work	175 (85.4)		Obligatorily	138 (67.3)
	Total	205 (100)		No response	25 (12.2)
Type of Shift Rotation	Regular	91 (44.4)		Total	205 (100)
	Irregular	84 (41)	Satisfaction of Shift Work	Yes	109 (53.2)
	No response	30 (14.6)		No	96 (46.8)
	Total	205 (100)		Total	205 (100)

Table 3. The frequency of digestive and mental disorders among the studied shift work employees

Disorders	Frequency (%)	Disorders	Frequency (%)
Digestive Discomforts		**Mental Disorders**	
Increased appetite	27 (19.56)	Headaches and Vertigo	15 (7.8)
Loss of appetite	33 (23.91)	Infuriation	19 (9.8)
Constipation	6 (4.34)	Carelessness at work	25 (13.02)
Indigestion	6 (4.34)	Frequent Mistakes	6 (3.1)
GI Ulcer	21 (15.21)	Impatience	22 (11.45)
Stomach pain and heartburn	40 (28.98)	Irritability	11 (5.7)
Diarrhea	2 (1.4)	Depression	42 (21.87)
Others	3 (2.1)	Tiredness during the day	52 (27.08)

Furthermore, according to the findings of the study, among the studied demographic and job characteristics, having the individual, family and social problems had statistically significant associations with the work schedule (P-value= 0.008), satisfaction of shift work (P-value<0.001), and the occupation of the employees(P-value= 0.04); between musculoskeletal disorders and the staff satisfaction of shift work (P-value= 0.01), as well as between suffering from cardiovascular disorders and marital status (P-value= 0.01) and the occupation of the employees(P-value= 0.04) (Table 4). Moreover, there were significant associations between suffering from gastrointestinal disorders and work schedule of the employees (P-value= 0.03), and also between sleep disorders and satisfaction of shift work (P-value=0.04). In addition, there were significant and positive correlations between suffering from musculoskeletal, cardiovascular and sleep disorders and age, job experience, and shift work experience(P-value<0.05) (Table 5). On the other hand, the results showed that there were statistically significant associations between suffering from sleep disorders and age (P-value= 0.02) and job experience (P-value=0.01).

Discussion

This study aimed to determine the effects of shift work on the associated health problems, together with the demographic and job characteristics underlying the problems, among the medical and diagnostic staff of the general teaching hospitals affiliated to Shiraz University of Medical Sciences in 2012.

According to the results obtained, there were significant associations between the employees' satisfaction of shift work and their individual, family, and social problems and sleep and musculoskeletal disorders, so that those who were satisfied with their work shift had fewer problems and disorders. The reason might be the desire of the employees to comply with the shift works; that is, those who are interested in shift work and are happy with it are more successful in adapting themselves to the job conditions and to adapt better; they manage their work schedule so that they can reduce the adverse effects of shift work. The findings of this study are in line with those of Arghami and colleagues (2014) and Choobineh and colleagues' studies (2007) (21, 53).

In this study, the employees' age was the determining factor affecting the sleep, musculoskeletal, and cardiovascular disorders brought about by the shift work; that is, with increasing age, suffering from these disorders was higher. Several studies have also introduced age as a risk factor for disorders resulting from shift work (30, 46, 54-56). This may be due to the fact that the elderly, because of getting involved with life problems, especially their job and work problems, may not be able to sleep or rest as much as younger people. By changes of the circadian cycle in older people, their sleep and waking patterns vary and they tend to rise at dawn. This can make the process of adapting to the shift work difficult for them. Fluctuating circadian cycle is also important here; that is to say, the speed that the cycle can adapt to new conditions and schedules is of crucial importance. The results of studies have shown that adaptation of the circadian cycle changes to the sudden changes in the sleep and wakefulness changes in the older people occurs slower than younger people. Also, with increasing age, the risk of musculoskeletal and cardiovascular disorders due to lifestyle and shift work is more likely (13).

In the present study, there were significant correlations among job experience, shift work experience and the sleep, musculoskeletal, and cardiovascular disorders caused by the shift work so that with increasing years of work and shift work, suffering from these disorders increased. This might be due to the fact that the shift changes, in the long run, adversely affected the health of shift work personnel. In addition, because the increases in the job and shift work experience is often associated with increasing age, the inability of adapting circadian cycle to the work shift changes can also explain the higher risk of these disorders. The results of the current study are in consistent?? with those of several similar studies (54-57). Furthermore, the results of Khajehnasiri and colleagues' study (2013) indicated that there were significant associations between job experience and shift work experience and suffering from depression (8).

In the present study, work schedule was one of the factors affecting the risk of digestive disorders as well as individual, family, social problems, so that such disorders and problems were more observed among shift workers than those involved in day work.

Table 4. The associations among individual, family and social problems, musculoskeletal, mental, cardiovascular disorders and the studies employees' demographic and job characteristics

Health Problems / Demographic and job characteristics		Individual, Family and Social Problems	Musculoskeletal Disorders	Cardiovascular Disorders	Mental Disorders
		Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Sex	Male	39.17 (21.94)	43.53 (32.93)	52.72 (11.61)	22.72 (20.28)
	Female	35.48 (20.56)	47.16 (23.33)	50.11 (14.93)	23.23 (19.31)
P-value		0.26	0.37	0.23	0.84
Marital Status	Single	40.03 (21.09)	44.58 (23.47)	52.23 (14.25)	19.75 (18.68)
	Married	36.41 (21.96)	47.53 (28.76)	49.61 (13.97)	26.15 (19.97)
P-value		0.23	0.42	0.18	0.01
Education Level	Lower than Bachelor's Degrees	37.76 (17.70)	44.22 (24.60)	50.94 (14.40)	22.51 (19.92)
	Bachelor's Degrees	37.79 (23.73)	47.67 (28.02)	51.29 (14.52)	23.83 (19.75)
	Master's Degrees	42.85 (16.29)	40.47 (15.62)	46.42 (7.81)	19.04 (17.11)
P-value		0.69	0.49	0.47	0.66
Employment Status	Official Employees	37.50 (22.66)	49 (35.46)	52.52 (15.08)	24.52 (21.58)
	Contract Employees	37.80 (23.19)	44.30 (22.58)	50.64 (14.39)	23.95 (18.82)
	Treaty Employees	44.64 (18.37)	38.69 (19.77)	51.78 (9.34)	10.71 (14.03)
	Temporary Employed Employees	37.38 (16.15)	50.22 (23.85)	48.87 (13.73)	23.64 (19.78)
P-value		0.71	0.38	0.68	0.10
Occupation	Nurses	35.52 (20.97)	47.61 (28.22)	51.56 (15.04)	25.87 (20.95)
	General Physicians	40 (17.03)	40.82 (12.61)	47.52 (6.83)	21.66 (18.08)
	Diagnostic Personnel	46.92 (22.03)	41.83 (21.32)	50 (14.10)	16.88 (15.06)
	Operating Room Staff	37.52 (22.78)	48.82 (27.01)	49.65 (11.12)	18.40 (16.11)
P-value		0.04	0.61	0.75	0.04
Work Schedule	Daytime work (Morning shift)	36.28 (23.02)	53.62 (39.37)	53.33 (17.92)	22.77 (19.44)
	Shift work	48.88 (20.83)	44.82 (23.36)	50.42 (13.31)	23.19 (19.67)
P-value		0.008	0.24	0.29	0.91
Type of Shift Rotation	Regular	38.37 (21.47)	42.76 (23.28)	51.46 (13.18)	22.63 (20.64)
	Irregular	34.92 (20.87)	46.72 (23.17)	49.50 (13.46)	23.42 (18.63)
P-value		0.28	0.26	0.33	0.79
Shift Selection	Voluntarily	33.73 (23.13)	45.63 (22.78)	49.61 (12.47)	24 (19.92)
	Obligatorily	37.13 (19.78)	44.32 (23.52)	54.42 (13.76)	22.70 (19.43)
P-value		0.39	0.74	0.69	0.71
Satisfaction of Shift Work	Yes	43.36 (22.11)	51.21 (21.34)	51.62 (14.53)	25.69 (19.14)
	No	31.77 (18.82)	41.62 (30.51)	50.21 (13.52)	20.98 (19.92)
P-value		<0.001	0.01	0.49	0.08

Table 5. The correlations among individual, family and social problems, musculoskeletal, mental, cardiovascular disorders and the studied employees' demographic and job characteristics

Health Problems / Demographic and job characteristics	Individual, Family and Social Problems	Musculoskeletal Disorders	Mental Disorders	Cardiovascular Disorders
Age	r=0.02 P-value=0.81	r=0.13 P-value=0.047	r=0.11 P-value=0.11	r=0.23 P-value=0.01
Job Experience	r=0.005 P-value=0.93	r=0.21 P-value=0.002	r=0.11 P-value=0.11	r=0.24 P-value<0.001
Shift Work Experience	r=0.01 P-value=0.84	r=0.18 P-value=0.007	r=0.07 P-value=0.28	r=0.25 P-value=0.003

It can be due to the fact that shift workers usually allocate less time for eating meals, which, over time, leads to changes in eating habits and the amount of food they eat. In addition, according to the results of a study, shift workers had a higher body mass index compared to the day time workers (2). The results of several other studies, also, have confirmed the findings of the present study concerning the negative effects of shift work on health and eating habits. They have concluded that shift workers have a higher risk for suffering from gastrointestinal diseases and peptic ulcer (6, 22, 41, 58). On the other hand, the results of this study showed that shift workers, compared with the day shift staff, had more individual, family, and social problems. Shift workers usually have less time to spend with their family. They are less likely to accompany their family in most social activities. This finding is consistent with the results of other studies (19, 28, 59, 60).

In the present study, although no significant association was observed, shift workers suffered from sleep disorder more than daytime workers. However, the results of some studies have shown a statistically significant association between suffering from sleep disorders and the work schedule and night shift work (3, 11, 12, 33, 46, 47, 61).

In the current study, there were significant associations between occupation and suffering from cardiovascular diseases and arising personal, family, and social problems, so that suffering from cardiovascular diseases among the studied nurses was more than other occupations. This could be due to their hard work in each working shift. However, the personal, family, and social problems in the diagnostic personnel were more than others. This can be due to the low number of diagnostic personnel in the hospitals studied. As a result, they bore the greatest burden of responsibility and working load and had to work in more shifts, compared to other employees. It is worth mentioning that since nurses are greater in number, they have more possibility to change their shifts. However, this should be investigated in future studies. These findings are similar to those of Choobineh and colleagues' study (2012) (55).

Also, there was a significant association between marital status and suffering from cardiovascular disorders caused by shift work in the current study, so that married employees had a greater risk than single ones. This might be because of the fact that married employees usually take more responsibilities in the family and society and experience more problems. Married employees are either mothers taking on the task of housekeeping and child rearing or fathers having the responsibility of the family. Being away from the family at nights due to the work, when the members of the family are at home, and its stresses can increase the risk of cardiovascular disorders. This finding is consistent with that of Choobineh and colleagues' study (2012) (55).

The present study had a limitation. Because of the cross-sectional nature of the study, it was not possible to find a causal relationship between the factors mentioned and their outcomes.

Conclusion

The results of this study indicated that the demographic characteristics such as age and marital status, and job characteristics such as work schedule, occupation, satisfaction of the shift work, job and shift work experience increased the individual, family and social problems, as well as cardiovascular, musculoskeletal, digestive and sleep disorders. Indeed, not paying due attention to these characteristics can increase the risk of arising the mentioned problems and suffering from these disorders, and impose heavy burdens on the employees, their families, communities and health systems. Therefore, in order to reduce these problems and disorders, the following suggestions can be offered: allowing voluntary shifts for the staff, shortening shift rotation, educating the shift workers in terms of their physical health and sleep hygiene, shortening the hours of night work, letting the night shift staff take a short nap, eating warm and suitable food during night shifts, limiting the employment of older employees in the shift work system, performing a physical exam for the new personnel to see if the risk factors of the above-mentioned disorders are present, doing certain medical tests for the shift workers and the older personnel, and providing health and welfare facilities for the staff and their families.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

RR and ZS contributed to conceiving and designing the study. The data was collected by SM and ES; and was analyzed and interpreted jointly by RR, AS, ZK, ES and SM. All authors contributed equally in writing the manuscript. All authors reviewed and approved the final manuscript.

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