

Problems related to shiftwork for health care workers at Shiraz University of Medical Sciences

A. Choobineh,¹ A. Rajaeefard² and M. Neghab¹

المشكلات الناجمة عن العمل بنظام المناوبات التي تواجه العاملين في الرعاية الصحية في جامعة شيراز للعلوم الطبية

علي رضا جوبينه، عبد الرضا رجائي فرد، مسعود نقاب

الخلاصة: أُجريت دراسة مستعرضة للمشكلات المتعلقة بالعمل بنظام المناوبات، التي تواجه العاملين في الرعاية الصحية في مستشفيات جامعة شيراز للعلوم الطبية، في جمهورية إيران الإسلامية. وتم في إطار هذه الدراسة استخدام استبيان لجمع معطيات عن البيانات الشخصية، وجدول المناوبات، والتأثيرات الضائرة للعمل بنظام المناوبات، من 432 من العاملين الذين تم انتقاؤهم عشوائياً. وأظهرت الدراسة أن النوم والمشكلات الاجتماعية والشخصية أكثر انتشاراً لدى العاملين في المناوبات المسائية بالمقارنة مع العاملين نهاراً. وقد تسببت جداول المناوبات غير المنتظمة في مزيد من المشكلات الاجتماعية والشخصية، وإلى الشعور بعدم الرضى عن العمل. أما الاختيار الطوعي للعمل بنظام المناوبات، فقد أسفر عن مشكلات صحية أقل.

ABSTRACT A cross-sectional study of shiftwork-related problems was carried out among health care workers at hospitals of Shiraz University of Medical Sciences, Islamic Republic of Iran. Data on personal details, shift schedule and adverse effects of shiftwork were collected from 432 randomly selected subjects by questionnaire. Sleep, social and subjective problems were more prevalent in shiftworkers than day workers. Irregular shiftwork schedules caused more social and subjective problems, as well as work dissatisfaction. Voluntary selection of shiftworking produced fewer health problems.

Problèmes liés au travail posté pour les agents de soins de santé à l'Université des Sciences médicales de Chiraz

RÉSUMÉ Une étude transversale des problèmes liés au travail posté a été réalisée auprès des agents de soins de santé des hôpitaux de l'Université des Sciences médicales de Chiraz (République islamique d'Iran). Des données personnelles ainsi que des informations sur les horaires de postes et les effets néfastes du travail posté ont été recueillies par questionnaire chez 432 sujets choisis au hasard. Les problèmes de sommeil, les problèmes personnels et sociaux étaient plus courants chez les travailleurs postés que chez les personnes travaillant le jour. L'irrégularité des horaires de travail causait davantage de problèmes personnels et sociaux, ainsi qu'une insatisfaction vis-à-vis du travail. Le choix volontaire du travail posté posait moins de problèmes de santé.

¹Department of Occupational Health; ²Department of Epidemiology and Biostatistics, School of Health, Shiraz University of Medical Sciences, Shiraz, Islamic Republic of Iran (Correspondence to A. Choobineh: alrchoobin@sums.ac.ir).

Received: 03/11/04; accepted: 15/02/05

Introduction

Shiftwork is now a major feature of working life across a broad range of industries. There are a number of reasons to expect that workers on a shift system may experience adverse consequences as a result of their work schedule [1,2]. It is well documented that certain physiologic functions, e.g. body temperature and hormonal release, vary systematically over the course of the day [3]. These circadian rhythms play an important role in regulating sleep, alertness and physiologic processes. When workers are forced to alter their sleep/activity schedule abruptly to correspond to a new work shift, there is usually a mismatch between the body's resources and the demands placed upon it until the circadian phase can adjust. Also, working in a shift system disrupts social activities. It is well established that the degree and quality of social interaction are related to physical and mental health [1].

Based on studies conducted in industrialized countries the prevalence of shiftwork is approximately 20% to 30% of the workforce [1,3,4]. There is good evidence that shiftwork has a negative effects on workers' health, safety and performance [2,3,5-8]. It is quite appropriate that attention is paid to this very important feature of socio-technical systems, which may adversely affect mental and physical health, social life and safety of shiftworkers.

In the medical domain, physicians, nurses and other ancillary staff are expected to be performing their jobs or to be on-call around-the-clock. Studies have shown that a greater percentage of health service workers work in a shift system than in any other employment sector. Hospitals, the biggest employer in the health care field, employ more night shiftworkers than any other industry [9]. It can therefore be inferred that in the medical domain, a high percentage of

the workforce may be affected by problems related to shiftwork.

There has been little research in the Islamic Republic of Iran on the extent to which shift schedules are related to health, individual and social problems among health care workers and it has been a neglected area in occupational health and safety issues at hospitals. The present study at Shiraz University of Medical Sciences (SUMS) hospitals was carried out with the following objectives: to characterize the shift schedules of health care staff; to study shiftwork-related problems among health care workers; and to investigate the association between the shift schedule and the problems reported. It is believed that the results of this study can be used to establish preventive strategies to decrease the problems of working in a shift system.

Methods

The cross-sectional study was conducted during June 2000 to August 2001. The participants were health care staff working in 38 different departments of 12 hospitals of SUMS, located in Shiraz city. In each department, 20% of the health care workers were randomly selected from the corresponding list of personnel (systematic method of sampling). A total of 432 health care workers participated in this study.

For each selected participant at each department, the person in charge of the study explained the purpose of the research and requested cooperation. An anonymous self-administrated questionnaire was used to collect the required data from each participant. The distribution and collection of questionnaires was performed through the person in charge of the study at each hospital. Identical questionnaires were used at all 12 hospitals.

The items included in the questionnaire were based on the related literature [3]. The questions were mostly Yes/No in type with some multiple choice questions. In addition to questions on insomnia, hypnotic drug use, effects of shiftwork on health (gastrointestinal, heart and mental problems), consequences of shiftwork on individual life (e.g. not enough time for attending to personal affairs and hobbies), family life (e.g. not enough time for parenting roles, care-giving roles and social companions) and social life (e.g. not enough time for participation in social gatherings and cultural events), there were questions on subject characteristics (e.g. age, sex, etc.), the shiftwork system that they worked under, whether they had voluntarily selected shift work and whether they intended to continue working in this system. For gastrointestinal problems, several questions were combined to produce the result (e.g. "Which one of the following problems have you experienced continuously: increased appetite, decreased appetite, constipation, diarrhoea, peptic ulcers, indigestion?"). For subjective problems also, several questions were combined to produce the result (e.g. "Which one of the following problems have you had continuously: dizziness, nervousness, carelessness, repetitive errors, irritation, depression, fatigue, and poor sleep quality?").

Data regarding the shift schedule adopted were gathered from interviews with supervisors of the departments. In this study, shiftwork was defined as any regularly taken employment outside the usual working day, defined arbitrarily as between 07.00 hours and 18.00 hours [3]. Based on this definition of shiftwork, the study population was divided into day workers (those working in morning shift from 07.30 to 15.30 hours permanently) as a control group (17.6%), and shiftworkers (those working in a shift

system including regular rotation, irregular rotation, permanent evening shift and permanent night shift) as a case group (82.4%). The effects of working conditions on the participants were compared between the case and the control groups. No significant differences existed between the 2 groups regarding age and job experience.

In order to estimate the reliability of the responses to items in the questionnaire, a test-retest method was applied [10] on 10% of the study population. The results of reliability testing revealed that for almost all subjective variables the Spearman correlation coefficients were greater than 0.71, which could be considered acceptable for these variables. McNemar and Wilcoxon tests also showed no significant difference between responses for the 2 occasions. The Pearson correlation coefficients for quantitative variables were greater than 0.9, indicating acceptable reliability of the questionnaire.

After data collection, the data were coded and transferred to the computer for further analysis. Statistical analyses were performed using SPSS, version 9. The chi-squared test was used to assess univariate associations between shift variables and reported problems. The level of statistical significance was set at 5%.

Results

Table 1 summarizes the personal details of the participants, their job titles and some characteristics of the shift system adopted in different departments of the hospitals studied. Most of the participants were female (71.5%). The majority of the study population were nurses and nurse's aids (65.5%). Since only 10% of the participants were below diploma level, the study population

Table 1 Participants' personal details, job title and work pattern in the studied hospitals (*n* = 432 participants)

Variable	Value	
	Mean (SD)	Min.–max.
Age (years)	34.78 (7.84)	19–59
Job experience (years)	13.74 (8.37)	1–40
Shiftwork experience (years)	13.27 (7.88)	1–32
	No.	%
Sex		
Female	309	71.5
Male	123	28.5
Marital status		
Single	130	30.0
Married	302	70.0
No. of children		
≤ 3	355	82.1
> 3	77	17.9
Education		
Below diploma	43	10.0
Diploma	127	29.3
Higher diploma	97	22.5
Degree or higher	165	38.2
Job title		
Nurse	147	34.0
Nurse's aid	99	22.9
Co-nurse's aid	37	8.6
Lab/radiology technician	67	15.5
Midwife	12	2.8
Other	70	16.2
Second job		
Yes	74	17.1
No	358	82.9
Work system		
Shiftworker	356	82.4
Day worker	76	17.6
Shift schedule		
Regular rotation	187	43.3
Irregular rotation	158	36.5
Evening (permanent)	6	1.4
Night (permanent)	5	1.2
Shift rotation		
Clockwise	122	35.5
Counterclockwise	223	64.5

SD = standard deviation.

Min.–max. = range of minimum and maximum values.

could be regarded as highly educated. Approximately 80% of the participants were engaged in a rotating shift schedule with the following pattern: day work, 07:30–15:30 hours; evening work, 15:00–22:00; night work, 21:30–08:00. Only 2.6% of them were involved in fixed evening and fixed night shift schedules. In a majority of cases (64.5%), shift rotation followed a counter-clockwise pattern.

Table 2 presents the prevalence of shiftwork-related problems reported by the study population. The prevalence of insomnia was higher among shiftworkers than day workers, although the difference did not reach statistical significance ($P < 0.1$). Irregular shift rotation was significantly associated with insomnia ($P < 0.05$). However, there were no significant differences between the 2 groups in the prevalence of hypnotic drug use, individual and family life problems or gastrointestinal and heart problems (Table 2). Overall, 84.3% of shiftworkers believed that shiftwork adversely affected their social lives, while this rate was 70.3% among day workers ($P < 0.05$).

The prevalence of subjective problems (dizziness, nervousness, fatigue, depression, carelessness and errors) among shiftworkers was significantly higher (88.0%) than among day workers (73.6%) ($P < 0.002$). There were also significant associations between the shift schedule and the prevalence of subjective problems, with fixed shift schedules causing fewer subjective problems than a rotating shift schedule. Significantly more shiftworkers were dissatisfied with their work schedule than were day workers (62.4% versus 37.0%) ($P < 0.001$) (Table 2). Homogeneity testing demonstrated that from the viewpoint of shiftwork, based on participants' reports, regular rotation caused the least negative effects on social life (79.0%) and irregular

Table 2 Prevalence of shiftwork-related problems reported among the study population

Problems reported	Shiftworkers (n = 356) %	Day workers (n = 76) %	P-value ^a
Insomnia	47.7	34.0	< 0.1
Hypnotic drug use	10.3	13.8	> 0.05
Adverse effects on own life	70.6	71.8	> 0.05
Adverse effects on family life	75.6	74.0	> 0.05
Adverse effects on social life	84.3	70.3	< 0.05
Gastrointestinal problems ^b	34.6	30.0	> 0.05
Heart problems	16.4	14.3	> 0.05
Subjective problems ^c	88.0	73.6	< 0.002
Work schedule dissatisfaction	62.4	37.0	< 0.001

^aChi-squared analysis of the prevalence of the problems between shift and day workers.

^bIncluding increased appetite, decreased appetite, constipation, diarrhoea, peptic ulcers and indigestion.

^cIncluding dizziness, nervousness, carelessness, repetitive errors, irritation, depression, fatigue, and poor sleep quality.

n = total number of participants.

rotation caused the most negative effects on social life (89.0%) ($P < 0.02$).

Only 24.5% of shiftworkers said that they had selected shiftwork voluntarily. The reasons for doing this were: interest, variation, having a second job and having more days off. The remaining 75.5% of shiftworkers reported that they were required to work in a shift system. There was a significant relationship between voluntary selection of shiftwork and an intention to continue shiftworking ($P < 0.001$). This indicated that those who had voluntarily selected shiftworking were willing to continue working in the shift system. "Involuntary" shiftworkers experienced a higher rate of negative effects of shiftwork on individual, family and social life and gastrointestinal problems than those who selected shiftworking voluntarily ($P < 0.05$).

Study of daily sleep duration in the fixed schedule workers demonstrated that the mean daily hours of sleep among day workers, fixed evening workers and fixed night workers were 7.2 hours, 7.14 hours and 4.6 hours, respectively. One-way analysis of variance showed a significant difference among the means ($P < 0.001$).

Discussion

This study showed that shiftwork might adversely affect shiftworkers in a number of ways. The results confirmed that the prevalence rates of insomnia and social and subjective problems among shiftworkers were high compared with day workers. This can be attributed to a work schedule that is unadjusted to workers' circadian patterns.

This is in agreement with the results of other studies in industrialized countries [11–15].

Our study of the shift schedule in SUMS hospitals indicated that shift rotation was usually irregular and was based on departmental needs. Indefinite and irregular work schedules caused more social and subjective problems, as well as shiftwork dissatisfaction, than regular schedules. Regular rotation caused fewer negative effects on social life than irregular rotation. Furthermore, counterclockwise rotation, which was observed in the majority of cases, could be regarded as a contributing factor for shiftwork-related problems among hospital staff [3,16].

Shiftworkers were not generally satisfied with their work schedule as compared with day workers. Meanwhile, among the shiftworkers, working in a fixed schedule was related to more satisfaction with the work schedule than working in a rotating system. Furthermore, a regular rotating schedule produced more satisfaction than an irregular rotation. These findings imply that devising a regular rotating shift system can contribute to improved shiftworking conditions and, to some extent, increase workers' satisfaction.

As the results of this study revealed, choosing to work in a shift system led to fewer health problems. People who volunteered to be engaged in shiftwork had a greater tendency to continue working in the shift system and reported fewer individual, family and social problems or gastrointestinal disorders. It follows that selection of personnel who wish to work in the shift system may be important for reducing problems associated with shiftwork.

The average daily duration of sleep for fixed night workers was less than the other groups. This finding agrees with Ohayon et al. [17]. Sleep deprivation in night workers is a likely reason for fatigue, irritability, dizziness, depression and other subjective problems. As Ohayon et al. affirmed, workers in this situation are more likely to feel sleepy at work and more likely to have work-related problems and sick leave [17].

Conclusion

In SUMS hospitals, shiftwork schedules are devised based on needs and workload. As this study showed, fixed and regular rotation schedules caused fewer problems for shiftworkers. It is therefore recommended that in each hospital a fixed regular shift schedule is devised. Alward and Monk stated that hospital administrators need to be sophisticated in their approach to the shift systems and should choose shift systems that are appropriate and beneficial to their personnel [18]. Hospital administrators should realize that enhancing the personal and professional well-being of shiftworkers is a cost-effective contribution to the quality of patient care.

The findings highlight the need to establish strategies for preventing negative consequences of shiftwork and improving occupational health among the health care workers of SUMS. Regarding this, appropriate personnel selection, improving shift schedules and devising regular shift systems based on chronobiology principles can be considered as effective measures.

References

1. Gordon NP et al. The prevalence and health impact of shift work. *American journal of public health*, 1986, 76(10):1225–8.

2. Horwitz IB, McCall BP. The impact of shift work on the risk and severity of injuries for hospital employees: an analysis using Oregon workers' compensation data. *Occupational medicine*, 2004, 54:556–63.
3. Monk TH, Folkard S, eds. *Making shift work tolerable*. London, Taylor & Francis, 1992.
4. Helander MG, ed. *A guide to the ergonomics of manufacturing*. London, Taylor & Francis, 1995.
5. Colligan MJ, Tepas DL. The stress of hours of work. *American Industrial Hygiene Association journal*, 1992, 47(11):686–95.
6. Folkard S. Is there a 'best compromise' shift system? *Ergonomics*, 1992, 35(12):1453–63.
7. Gold DR et al. Rotating shift work, sleep, and accidents related to sleepiness in hospital nurses. *American journal of public health*, 1992, 82(7):1011–4.
8. Smith L et al. Work shift duration: a review comparing eight hour and 12 hour shift systems. *Occupational and environmental medicine*, 1998, 55:217–29.
9. Schirmer J. Health and safety hazards of shiftwork: implications for health care workers and strategies for prevention. In: Charney W, ed. *Handbook of modern hospital safety*. New York, Lewis, 1999:799–817.
10. Colin D. *Beginning research in psychology: a practical guide to research methods and statistics*. Oxford, Blackwell, 1995.
11. Colligan MJ et al. Frequency of sickness absence and worksite clinic visits among nurses as a function of shift. *Applied ergonomics*, 1979, 10:79–85.
12. Smith MJ et al. Health and safety consequences of shift work in the food processing industry. *Ergonomics*, 1982, 25:133–44.
13. Kurumatani N et al. The effects of frequently rotating shift work on sleep and the family life of hospital nurses. *Ergonomics*, 1994, 37(6):995–1007.
14. Munakata M et al. Influence of night shift work on psychologic state and cardiovascular and neuroendocrine responses in healthy nurses. *Hypertension research*, 2001, 24(1):25–31.
15. Suzuki K et al. Mental health status, shift work, and occupational accidents among hospital nurses in Japan. *Journal of occupational health*, 2004, 46:448–54.
16. Czeisler CA, Moore-Ede MC, Coleman RH. Rotating shift work schedules that disrupt sleep are improved by applying circadian principles. *Science*, 1982, 217:460–3.
17. Ohayon MM et al. Prevalence and consequences of sleep disorders in a shift worker population. *Journal of psychosomatic research*, 2002, 53(1):577–83.
18. Alward RR, Monk TH. Supporting shift workers. *Journal of nursing administration*, 1994, 24(5):53–9.