Common mental disorders
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Chapter 7
Shift work and mental health sickness absence: a 10-year observational cohort study among male production workers.

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Common Mental Disorders  
Chapter 7

Introduction

In today’s Western societies, only a quarter of the labour force works regular nine-to-five office hours, while the remainder is engaged in shift work or has irregular work hours [1]. Shift workers more often than day workers report mental health symptoms, such as fatigue, nervousness, anxiety, and depressed mood; they also use sleeping pills and tranquilizers more often [2, 3]. Shift workers may experience problems to sleep during the day when the circadian rhythm promotes alertness. Short or poor sleep leads to insufficient recovery and stress [4, 5]. However, disturbed sleep is not the only pathway between shift work and mental health. Some neuro-endocrine mechanisms may contribute to depressed mood in shift workers. Shift work reduces glucocorticoid sensitivity of the peripheral tissues, resulting in functional hypercortisolism [6]. Glucocorticoid resistance and hyperactivity of the hypothalamic-pituitary-adrenocortical axis play a role in the pathogenesis of depression and other psychiatric disorders [7]. Shift work also disturbs nocturnal melatonin secretion; reduced endogenous melatonin levels have been associated with the onset of depression and anxiety disorders [8].

Besides disturbed sleep and neuro-endocrine mechanisms, psychosocial pathways could explain why shift workers experience more mental health symptoms than day workers [3,9]. Shift work interferes with participation in family life and alienates workers from their social environment by desynchronization from daily societal habits. Haines et al [10] estimated that 70% of the effect of shift work on depression is direct and 30% is mediated through work–family conflict and social desynchronization.

The fact that shift workers more often than day workers experience mental health problems does not necessarily implicate they are off work due to mental disorders more frequently, because the threshold of taking sick-leave may differ between shift workers and day workers. Merkus et al. [11] found inconclusive evidence for increased sickness absence (SA) levels among shift workers. We found no epidemiological studies that investigated SA due to mental disorders in shift workers. The objective of this observational study was to compare shift and day workers for risk of mental SA, addressing the research questions:

i) Do shift workers have a higher risk of mental SA than day workers?

ii) Do shift workers have a higher risk of recurrent mental SA than day workers?

Abstract

Purpose Epidemiological studies investigating mental sickness absence (SA) in shift workers are lacking. This 10-year observational study investigated the risk of mental SA in shift workers compared with day workers.

Methods The data of 5826 male production workers were used for analyses: 4288 (74%) shift and 1538 (26%) day workers. The risk of mental SA was analyzed with Cox regression analysis. Hazard ratios (HR) and 95% confidence intervals (CI) were adjusted for age and occupational grade.

Results 351 shift workers and 126 day workers had incident mental SA during 10-year follow-up. The risk of mental SA did not differ (HR=1.03; 95% CI 0.84–1.26) between shift and day workers. In shift workers, the risk of mood disorders (HR=1.87; 95% CI 0.73–4.76) and neurotic disorders (HR=1.29; 95% CI 0.89–1.87) was non-significantly higher, whereas the risk of emotional disturbance (HR=0.72; 95% CI 0.49–1.05) was non-significantly lower than in day workers. The risk of recurrent mental SA did not differ (HR=1.04; 95% CI 0.62–1.74) between shift and day workers.

Conclusion The risk of incident and recurrent mental SA did not differ between shift and day workers.
Methods

Study population
The study population consisted of 6678 male production workers employed at a steel mill. SA data were retrieved from an occupational health service (OHS) register and work schedules were obtained from the employer’s payroll. Baseline was set at 1 January 2002 and workers were followed until 31 December 2011. We excluded workers whose shift schedules were not available (n=527) or differed from a 5-shift schedule (n=107); 218 workers were excluded because they had a mental SA in the 2 years prior to baseline. Consequently, the data of 5826 male steel workers were analysed: 4288 (74%) shift workers with a forward rotating 5-shift schedule MMEEXNNXX (M=morning 6 a.m. to 2 p.m., E=evening 2 p.m. to 10 p.m., N=night 10 p.m. to 6 a.m., and X=day off) and 1538 (26%) day workers (8 a.m. to 5 p.m.). During follow-up, 1484 (1084 shift and 400 day) workers left employment; the mean (standard deviation) follow-up period was 7.7 (3.0) years. The Medical Ethics Committee of the University Medical Center Groningen granted ethical clearance for this register-based study.

Mental SA
SA was defined as a financially compensated temporary leave from work due to work-related and non-work-related injuries and illness. In The Netherlands, SA is employer-compensated and medically certified by an occupational physician (OP) within 42 days of reporting sick. SA certified within International Classification of Diseases (ICD-10) categories emotional disturbance (ICD-10 R45) or mental and behavioural disorder (ICD-10 F00–F99) was defined as mental SA. Recurrent mental SA was defined as any mental SA episode occurring >28 days after recovery from the first mental SA episode since January 2002.

Statistics
All analyses were performed with IBM SPSS Statistics version 20. The risks of incident and first recurrence of mental SA were analysed with Cox regression including work schedule (shift versus daytime) as independent variable with age and occupational grade (1=unskilled, 2=semi-skilled, 3=skilled steel workers, 4=maintenance technicians, and 5=supervisors) as covariates.

During the study period, 386 workers changed their work schedule: 292 from shift to day work and 94 from day to shift work. Ten percent of the workers who changed their work schedule had mental SA as compared with 8% of those who did not change their work schedule. To exclude potential interactive effects between mental SA and work schedule, we performed a sensitivity analysis including the 5440 (3996 shift and 1444 day) workers who did not change their work schedule during the study period.

Results
Day workers were older and worked more hours/week in higher grade jobs than shift workers (Table 1). 477 (35 shift and 126 day) workers had mental SA. Shift workers had no increased risk of incident mental SA (HR=1.03; 95% CI 0.94–1.12) compared with day workers. Shift workers had higher risks of SA due to mood and neurotic disorders, although the difference between shift and day workers was not significant (Table 2).

117 (96 shift and 21 day) workers had recurrent mental SA. Shift workers had no increased risk of recurrent mental SA (HR=1.04; 95% CI 0.62–1.74) compared with day workers.

Table 1 Baseline characteristics the study population of male production workers (N=5826)

<table>
<thead>
<tr>
<th></th>
<th>shift workers (n=4288)</th>
<th>day workers (n=1538)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age mean (SD)</td>
<td>45.3 (8.0)</td>
<td>47.2 (7.0)</td>
</tr>
<tr>
<td>Marital status:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>397 (92)</td>
<td>126 (8)</td>
</tr>
<tr>
<td>Divorced/widowed</td>
<td>321 (76)</td>
<td>158 (10)</td>
</tr>
<tr>
<td>Work hours per week</td>
<td>33.8 (1.9)</td>
<td>39.6 (2.0)</td>
</tr>
<tr>
<td>Employment duration</td>
<td>18.6 (7.6)</td>
<td>22.3 (8.3)</td>
</tr>
<tr>
<td>Occupational grade:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unskilled</td>
<td>386 (18.3)</td>
<td>68 (4.4)</td>
</tr>
<tr>
<td>Semi-skilled</td>
<td>1685 (79.6)</td>
<td>334 (21.9)</td>
</tr>
<tr>
<td>Skilled</td>
<td>1578 (72.9)</td>
<td>657 (42.5)</td>
</tr>
<tr>
<td>Technician/supervisor</td>
<td>639 (29.2)</td>
<td>479 (31.0)</td>
</tr>
</tbody>
</table>

Table 2 Risk of mental sickness absence (SA)

<table>
<thead>
<tr>
<th>ICD-10</th>
<th>n</th>
<th>%</th>
<th>n</th>
<th>%</th>
<th>HR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emotional disturbance</td>
<td>R45</td>
<td>154</td>
<td>4</td>
<td>53</td>
<td>3</td>
<td>0.72</td>
</tr>
<tr>
<td>Mood disorders</td>
<td>F30-39</td>
<td>27</td>
<td>1</td>
<td>8</td>
<td>1</td>
<td>1.87</td>
</tr>
<tr>
<td>Neurotic disorders</td>
<td>F40-49</td>
<td>155</td>
<td>4</td>
<td>57</td>
<td>4</td>
<td>1.29</td>
</tr>
<tr>
<td>Other mental disorders</td>
<td>F00-29; F50-99</td>
<td>15</td>
<td>0</td>
<td>8</td>
<td>1</td>
<td>n.a.</td>
</tr>
<tr>
<td>All</td>
<td>R45; F00-99</td>
<td>351</td>
<td>8</td>
<td>126</td>
<td>8</td>
<td>1.03</td>
</tr>
</tbody>
</table>

The table shows mental SA stratified by ICD-10 diagnosis and hazard ratios (HR) with related 95% confidence intervals (CI) of Cox regression analysis, adjusted for age and occupational grade; HR>1 reflects higher and HR<1 lower risk of mental SA in Shift workers compared with Day workers.

* standard deviation  
† Chi-square test  
‡ parametric t-test for independent samples  
§ percentage of the total number of shift or day workers  
n.a. not analyzed because of the low number of events
Conclusion

We conclude that the risk of incident and recurrent mental SA did not differ between shift and day workers. Larger-scale studies are required to differentiate between the mental health effects of shift work and mental SA diagnoses. Furthermore, the relationship between shift work and SA due to mood disorders should be examined in more detail.

Sensitivity analysis

Of the workers with no change in work schedule, 357 (251 shift and 106 day) workers had incident and 107 (86 shift and 21 day) workers had recurrent mental SA. The risks of incident (HR=1.19; 95% CI 0.88–1.60) and recurrent (HR=0.83; 95% CI 0.48–1.43) mental SA did not differ between shift workers and day workers.

Discussion

Our 10-year observational study showed that shift workers did not have a higher risk of incident and recurrent mental SA than day workers. The risk of incident SA due to mood disorders was higher among shift workers, but did not differ significantly from the risk among day workers. The statistical power of a Cox regression model including 3 independent variables and 27 events (i.e., SA episodes due to mood disorders) is debatable, although Vittinghoff and McCulloch [12] showed that confidence interval coverage, type I error, and relative bias with 5-9 events per variable were comparable to those with 10-16 events per variable. In a previous Dutch study, Driessen et al. [13] found a higher risk of depressed mood among male and actual shift workers as compared with female and former shift workers, but the results were no longer significant when educational level and psychosocial work factors were being controlled for.

Selection issues

Shift workers may represent a relatively healthy part of the working population. This healthy worker selection starts with the worker’s judgement of his ability to withstand shift work and may be reinforced by pre-placement medical assessments [14]. Healthy worker selection then continues in terms of a survival effect in which less healthy shift workers are likely to transfer to daytime work or quit the job. We had no information about pre-employment selection mechanisms and could not identify which day workers were former shift workers, because payroll data from before January 2000 were not available. The sensitivity analysis including only the workers with the same schedule throughout the 10-year study period confirmed the finding that the risk of mental SA did not differ between shift and day workers.

Methodological considerations

Although the use of OP-recorded ICD-10 diagnoses restricted recall and social desirability bias, the reliability of OP-diagnoses is being debated. O’Neill et al. [14] found no systematic difference between OPs and psychiatrists in their diagnostic labelling of mental ill-health, although within-group reliabilities were low for some diagnoses, particularly ‘stress’. We limited potential diagnostic misclassification by using main ICD-10 diagnoses (e.g., ‘neurotic disorders’) instead of specific diagnoses (e.g., burnout, adjustment disorder, or anxiety disorder).

All workers were employed at the same company. Consequently, differences in mental SA could not be attributed to organizational policies and practices. The study population is a convenience sample which may not be representative of the general working population. Furthermore, only men working in a forward rotating 5-shift schedule were included. The results might not generalize to female shift workers (e.g., in healthcare) and workers engaged in other shift systems.