

Working irregular shift patterns is associated with functional constipation among healthy trainee nurses

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Abstract

The circadian system has a role in regulating gastrointestinal physiology. Perturbation of this system is associated with gastrointestinal tract dysfunction. Shiftwork and poor sleep quality are associated with functional gastrointestinal disorders among many professional groups. This study compared bowel habits between trainee nurses with regular and irregular patterns of shiftwork. Male and female nursing students, enrolled on the first year (regular shifts; n=49) and the fourth year (irregular shifts, n=48) of a nursing degree course were surveyed. Questionnaires were used to assess functional diarrhea and constipation over a three month period. The prevalence of functional constipation among regular shift workers was lower than that found among irregular shift workers; 31.3% and 61.2%, respectively. There was no difference between the two groups in relation to the prevalence of diarrhea. This suggests an association between shiftwork and functional constipation, but not with functional diarrhea.

Introduction

There is emerging evidence that the endogenous circadian system has a major influence on most physiological and behavioral processes including gastrointestinal function.¹ Circulating concentrations of several hormones fluctuate in relation to: light-dark cycles, feed-fast cycles and sleep-wake cycles. Perturbation of internal body clocks leads to endocrine and metabolic disturbances which in turn affect physical and psychological wellbeing.²⁻⁴ Patterns of shiftwork and trans-meridian travel by air are both aspects of modern life with the potential to severely desynchronize internal and external clocks and cycles. The study of sleep disorders, jet airline travel and shiftwork has been a rich source of research regarding the detrimental effects of disturbances to the rhythmicity of bodily clocks.

Reports have appeared linking irregular shiftwork patterns to several conditions including: cardiovascular disease, diabetes, obesity, appetite disturbance, neoplasia, pregnancy complications, menstrual irregularities, and poor mental health.^{5,6} Epidemiological studies have shown a strong association between complaints of the upper gastrointestinal system, such as peptic ulcers, and irregular shiftwork patterns.⁶ However the association of irregular shiftwork with disorders of the lower gastrointestinal, such as constipation, diarrhea and irritable bowel syndrome, are less well established.⁷⁻¹⁰ Constipation is of particular importance as there is experimental and epidemiological evidence suggesting strong linkage between constipation and colorectal cancer.^{11,12} Regular but short bouts of constipation that may seem innocuous may have significant long-term consequences.

The aim of this study was to assess symptoms associated with lower gastrointestinal tract dysfunction among healthy trainee nurses who work regular and irregular shift patterns. Comparisons of self-reported bowel habits, between these two groups of participants, were employed to study the influence of shiftwork on the prevalence of constipation and diarrhea.

Materials and Methods

Study subjects

The study population consisted of 127 participants and took place between May and June 2015. Participants were all self-declared healthy trainee nurses. A total of 108 self-administered questionnaires, relating to bowel habits, were returned completed giving a response rate of 85%. Two candidates were excluded due to pregnancy, seven were excluded due to self-declared ongoing illness and two questionnaire forms were excluded because they were incomplete. Data analysis was performed on 97 completed questionnaires.

Participants were all drawn from a group of trainee nurses who were all enrolled on the same university degree program. The program included a significant clinical practicum component. This practical experience involved standardized hospital work shifts; run on the same guidelines adopted for professional qualified nurses by the local health authority. The degree program was structured such that clinical placements were in local health clinics and hospitals around Bahrain. Students on the first year of the degree were exposed to health clinics rather than hospital wards and would normally work on daytime shifts (morning shifts, 07:00 to 14:30). In con-

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Key words: gastro intestinal dysfunction, constipation, diarrhea, shiftwork, circadian rhythm.

Contributions: AE initiated the study and carried out all data collection; SF, performed all data analysis and was the main writer of the manuscript.

Conflict of interest: the authors declare no potential conflict of interest.

Funding: support was provided by RCSI-Bahrain.

Received for publication: 17 May 2017.

Accepted for publication: 6 August 2017.

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Gastroenterology Insights 2017; 8:7229
doi:10.4081/gi.2017.7229

trast, students on the fourth year of the degree program would normally be required to work on hospital wards and it would be normal for them to work irregular shift rotations. These shifts were rotated randomly for these participants, based on the timetabling and scheduling by the hospitals. The shift periods for hospitals were defined as morning shifts (06:00 to 14:30) evening shifts (14:30 to 22:30) and night shifts (22:30 to 06:30). Essentially two groups of participants were included in the study: first year students that worked regular morning shifts, and fourth-year students that worked irregular shift patterns.

Questionnaires

Participants completed self-reported bowel habits questionnaires which assessed functional diarrhea and functional constipation over a three-month period using standardized criteria; ROME III.¹³ Questionnaire modules related to functional constipation and functional diarrhea were downloaded and printed from the ROME website (<http://www.romecriteria.org/criteria/>). The questionnaire contained items describing seven prevalent symptoms for functional constipation and seven for functional diarrhea, and the severity of each symptom experienced during the previous

three months was measured by a 5-point Likert scale. This ranged from (0) Never or rarely, (1) Sometimes, (2) Often, (3) Most of the time and (4) Always. Likert scores were dichotomized for each item (using 2-often) to give a positive or negative endorsement of functional constipation and functional diarrhea.

Participants from the two groups were also surveyed concerning their sleep patterns over the same period. Quality of sleep was assessed according to the approach of Nojkov *et al.*⁷ where three items of the Modified Sleep-50 questionnaire was adopted: *Generally, I sleep badly, I feel sleepy during the day and struggle to remain alert, and I have difficulty falling asleep.*

Statistics

Frequencies of cases of functional diarrhea and functional constipation were compared between the irregular and regular shiftwork groups. Comparisons were also made of frequencies of individuals' bowel function symptoms between regular and irregular shift workers. Statistical analysis was performed using IBM SPSS Statistics version 22.0 (IBM, Chicago, IL, USA). The continuous variables were expressed as mean (standard deviation, SD). Univariate associations were analyzed Chi-squared or Fisher exact test for categorical variables. A p-values of less than 0.05 was taken to be statistically significant. Results were presented by odds ratio (OR) also with 95% confidence interval (CI).

Ethics

The protocol for this study was reviewed and approved by institutional Research and Ethics Committee of RSCI-Bahrain. All subjects submitted informed consent forms before completing questionnaires.

Results

A total of 97 participants were included in the study; with 48 (49.5%) working only on the morning shift and 49 (50.5%) irregular shift workers. All 48 students on the first year of their degree program only worked morning shifts. In contrast all 49 students on the fourth year of their degree program who worked irregular shift patterns. The mean age of participants was 19.1 years (2.86 SD) for regular shift workers and 21.9 years (0.97 SD) for irregular shift workers. The majority of participants were female (75.3%) and there was no significant difference in ratio of male to female between participants in both groups. The majority of

participants (84.5%) worked a minimum of eight hours per shift, the remainder worked longer hours. These are summarized on Table 1.

The prevalences of functional constipation and functional diarrhea were 46.4% and 7.2% respectively for the overall number of participants from both groups. The prevalence of functional constipation among regular shift workers was lower than that found among irregular shift workers, at 31.3% and 61.2%, respectively. The prevalences of functional diarrhea for regular shift workers and irregular shift workers were 4.2% and 10.2%, respectively. These

results were not significantly different between the two groups.

Sleep quality was poorer for the group that worked irregular shifts, as assessed by the questions related to; poor sleep quality, daytime-sleepiness and having difficulty falling asleep.

Table 2 shows the risk factors associated with functional constipation and functional diarrhea. A significant risk of functional constipation was associated with; irregular shiftwork, sleeping badly and having difficulty falling asleep. However, no significant associations were seen with functional diarrhea.

Table 1. Distribution of sexes, types of shifts worked, sleep patterns and type of gastrointestinal dysfunction among nursing students on year 1 and year 4 of a degree program.

	1 st year students (n=48)		4 th year students (n=49)		P-value
	N	%	N	%	
Sex					NS
Male	14	29.2	10	20.0	
Female	34	70.8	39	80.0	
Shift worked					<0.001
Morning shift only	48	100.0	0	0.0	
Irregular shifts	0	0.0	49	100.0	
Number of hours worked					<0.001
8 hours only	48	100.0	34	69.4	
More than 8 hours	0	0.0	15	30.6	
Poor sleep quality					<0.001
No	38	79.2	14	28.6	
Yes	10	20.8	35	71.4	
Daytime sleepiness					<0.001
No	38	79.2	12	24.5	
Yes	10	20.8	37	75.5	
Difficulty falling asleep					<0.001
No	36	75.0	15	30.6	
Yes	12	25.0	34	69.4	
Constipation					0.003
No constipation	33	68.8	19	38.8	
Constipation	15	31.3	30	61.2	
Diarrhea					NS
No diarrhea	46	95.8	44	89.8	
Diarrhea	2	4.2	5	10.2	

NS, not significant.

Table 2. Risk of gastrointestinal dysfunction based upon sex, type of shiftwork and sleep abnormalities.

	Constipation			Diarrhea		
	OR	95% CI	P-value	OR	95% CI	P-value
Female sex	1.020	0.509-2.042	NS	0.557	0.219-1.416	NS
Irregular shift work	1.904	1.200-3.021	0.003	1.789	0.545-5.872	NS
Work longer than 8 hours	1.066	0.887-1.280	NS	1.506	0.788-2.876	NS
Generally, I sleep badly	1.618	1.072-2.441	0.013	1.258	0.524-3.024	NS
I feel sleepy during the day and struggle to remain alert	1.305	0.872-1.953	NS	1.220	0.507-2.936	NS
I have difficulty falling asleep	1.600	1.058-2.420	0.016	1.909	0.583-6.255	NS

OR, odds ratio; CI, confidence interval; NS, not significant.

Discussion

Irregular shiftwork disrupts the synchronous relationship between the internal rhythms and the outside environment. This was seen in the present study by the significantly higher proportion of participants who reported disturbed sleep in the irregular shiftwork group. A significant difference was seen in the frequency of reported symptoms associated with functional constipation between the irregular shift workers and the regular shift workers. However, no such significant difference was seen between the two groups for symptoms of functional diarrhea, which suggests that constipation, but not diarrhea, is associated with irregular shiftwork. These findings reflect those of previous studies involving qualified nurses.^{7,9,10} This high proportion of reported functional constipation cases also correlated with poor sleep quality and difficulty falling asleep, but not with daytime-sleepiness. This suggests that daytime-sleepiness is an aspect of disturbed sleep that is not directly related to constipation or that the reasons for daytime-sleepiness were not comprehensively accounted in the design of this study. As with shiftwork per se, diarrhea did not appear to be related to: poor sleep quality, difficulty falling asleep or daytime-sleepiness. Approximately one third of the shift workers (15 out of 49) worked shifts of longer than eight hours. The prevalence of neither constipation nor diarrhea was shown to be higher for this small subgroup that worked longer shifts, which implies that they are not related to length of shift worked but rather rotating irregular shifts.

Conclusions

Our present study did not take into account assessment of the quality or quanti-

ty of meals consumed by the participants, which may be an important confounder related to constipation. Shiftwork may directly induce appetite disturbances but there are also no biological factors that influence the type of food consumed by nurses who work at night. Workers may often consume cold meals, due to the non-availability of 24-hour canteen services. Low quality fast food meals may also be a convenient option for individuals working long anti-social hours. Also stress which is strongly linked to shiftwork among nurses was not taken into account as a confounder.¹⁴ The use of a psychometric instrument to assess stress could have added value to this study.

This study of trainee nurses provides further evidence suggesting an association between shiftwork and poor sleep quality with functional constipation. However it does not suggest an association with functional diarrhea.

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