A cross-sectional study of the association between overnight call and irritable bowel syndrome in medical students

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BACKGROUND: Shift work has been associated with irritable bowel syndrome (IBS), which includes gastrointestinal symptoms such as abdominal pain, constipation and diarrhea. Overnight call shifts also lead to a disruption of the endogenous circadian rhythm.
HYPOTHESIS: Medical students who perform intermittent overnight call shifts will demonstrate a higher prevalence of IBS symptoms when compared with medical students who perform no overnight call shifts.
METHODS: First- and second-year (preclinical) medical students have no overnight call requirements, whereas third- and fourth-year medical (clerkship) students do have overnight call requirements. All medical students at the Schulich School of Medicine and Dentistry (London, Ontario) were invited to complete an anonymous, web-based survey or an identical paper copy that included demographic data, the Rome III questionnaire and the IBS-Quality of Life measure (IBS-QOL). The prevalence of IBS symptoms and quality of life secondary to those symptoms were determined.
RESULTS: Data were available for 247 medical students (110 preclinical students, 118 clerkship students and 19 excluded surveys). There was no significant difference in the presence of IBS between preclinical and clerkship students (21 of 110 [19.1%] versus 26 of 118 [22.0%]; P=0.58). The were no significant differences in mean (± SD) IBS-QOL score of those with IBS between preclinical (43.5±8.3) and clerkship students (45.7±13.8) (P=0.53).
CONCLUSIONS: Participation in overnight call was not associated with the development of IBS or a lower quality of life secondary to IBS in medical students.

Key Words: *Irritable bowel syndrome; Overnight call; Sleep*

Une étude transversale de l'association entre les gardes de nuit et le syndrome du côlon irritable chez les étudiants en médecine

HISTORIQUE : Le travail par quart a été associé au syndrome du côlon irritable (SCI), qui inclut des symptômes gastro-intestinaux comme les maux de ventre, la constipation et la diarrhée. Les quarts de garde de nuit entraînent également une perturbation du rythme circadien endogène.
HYPOTHÈSE : Les étudiants en médecine qui font des quarts de garde de nuit intermittents démontreront une plus forte prévalence de symptômes de SCI que les étudiants en médecine qui n'en font pas.
MÉTHODOLOGIE : Les étudiants en médecine de première et de deuxième année (période préclinique) n'ont pas besoin de faire des gardes de nuit, tandis que les étudiants en médecine de troisième et quatrième année (stage clinique) doivent en faire. Tous les étudiants en médecine de l'école de médecine et de dentisterie de Schulich de London, en Ontario, ont été invités à remplir le même sondage anonyme par Internet ou sur papier, lequel incluait des données démographiques, le questionnaire de Rome III et la mesure de qualité de vie du SCI (SCI-QdV). Ils ont déterminé la prévalence de symptômes de SCI et de qualité de vie après l'apparition de ces symptômes.
RÉSULTATS : Les auteurs ont obtenu des données au sujet de 247 étudiants en médecine (110 étudiants en période préclinique, 118 étudiants en stage clinique et 19 sondages exclus). Il n'y avait pas de différence significative en présence de SCI entre les étudiants en période préclinique et ceux en stage clinique (21 sur 110 [19,1 %] par rapport à 26 sur 118 [22,0 %]; P=0,58), ni entre l'indice de SCI-QdV moyen (± ÉT) des étudiants en médecine atteints de SCI en période préclinique (43,5±8,3) et de ceux en stage clinique (45,7±13,8) (P=0,53).
CONCLUSIONS : La participation aux gardes de nuit ne s'associait pas à l'apparition d'un SCI ou d'une moins bonne qualité de vie causée par le SCI chez les étudiants en médecine.

Functional bowel disorders are symptom-based gastrointestinal disorders previously defined by an expert panel during the Rome process (1). Functional bowel disorders are common in the population, with the most prevalent being irritable bowel syndrome (IBS), which is defined by the presence of abdominal pain or discomfort in association with altered bowel habits (1).

Common risk factors for IBS include female sex (female to male ratio of 2:1) and age younger than 45 years, with a spike seen in elderly patients (2,3). Other risk factors include health status, comorbid conditions, diet and mental health (4-7). The pathophysiology of IBS remains unknown; however, associations have been found with gastrointestinal motility (8,9), visceral hypersensitivity (10,11), intestinal inflammation (12,13), intestinal infections (14,15), alterations in bowel flora (16,17), bacteria overgrowth (18,19), food sensitivity (20,21), genetics (22,23) and psychosocial dysfunction (24,25).

Several studies have reported associations between IBS and sleep disruption (26-28). Three studies (29-31) found that nurses who work rotating shifts have more IBS and gastrointestinal symptoms, either related to sleep disturbance (30,31) or to disruption of circadian rhythm (29).

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TABLE 1
Study population demographics

	Preclinical (n=110)	Clerkship (n=118)	Overall (n=228)
Age, years			
Mean ± SD (n)	24.1±2.3 (79)	25.7±1.6 (94)	25.0±2.1 (173)
Range	20–36	23–31	20–36
Sex			
Female	54 (49.1)	50 (42.4)	104 (47.7)
Male	55 (50.0)	58 (49.2)	113 (51.8)
Current clerkship rotation			
Not applicable or preclinical students	107 (97.3)	16 (13.5)	126 (57.8)
Internal medicine	–	22 (18.6)	22 (10.1)
Surgery	–	19 (16.1)	19 (8.7)
Psychiatry	–	12 (10.2)	12 (5.5)
Family medicine	–	22 (18.6)	22 (10.1)
Obstetrics/gynecology	–	8 (6.8)	8 (3.7)
Pediatrics	–	8 (6.8)	8 (3.7)

Data presented as n (%) unless otherwise indicated

The aim of the present study was to determine whether medical students who participate in overnight call shifts experience an increase in IBS prevalence. We conducted an observational study to determine the prevalence of IBS in medical students in first- and second-year (preclinical) compared with third- and fourth-year clerkship students. Clerkship students (also known as 'clinical clerks') in Canada participate in clinical rotations requiring overnight and weekend call, and often have irregular eating habits due to patient care responsibilities. Preclinical students, who have no overnight call, work a regular day, and attend class and tutorial schedules were used as a control group. We hypothesized that the prevalence of IBS would be greater in clerkship students compared with preclinical students.

METHODS

Study subjects

All preclinical and clerkship students attending the Schulich School of Medicine and Dentistry at The University of Western Ontario in the London and Windsor campuses (Ontario), were contacted via e-mail. In total, 608 medical students were contacted. Medical students interested in participating were directed to an Internet-based study survey or completed an anonymous paper survey. All surveys were voluntary and anonymous, with no identifying data collected. Participants provided informed consent to participate. The study protocol and survey were reviewed and authorized by the Office of Research Ethics at The University of Western Ontario. The study recruitment period was during March and April 2011.

Students with pre-existing gastrointestinal disorders were excluded from the study. The remaining enrolled subjects were classified into two groups based on their year of medical studies. Clerkship students participate in five to seven overnight calls per month depending on their clinical rotation. Preclinical students attend classes only and are not on call.

Questionnaires

All subjects completed the following surveys:

1. A general demographic form, which included questions on age, sex, current year of medical school and current clerkship rotation (if applicable).
2. IBS modules from the Rome III questionnaire (32). This validated survey was used to identify subjects with IBS. Permission was received from the Rome Foundation for use of this questionnaire.
3. IBS-quality of life measure (IBS-QOL). This is a validated, 34-item survey developed to assess the impact of IBS symptoms on disease-specific quality of life (33). A lower score on this scale represents a better quality of life. Permission was obtained from Dr DL Patrick, Dr D Drossman and the MAPI Research Trust, allowing use of the IBS-QOL questionnaire in the present study.

Statistical analysis

The primary outcome of the study was defined as the comparison of prevalence of IBS between preclinical and clerkship students. Secondary outcomes included comparisons of IBS-QOL scores between students in each year, with scores consistent with IBS according to the Rome III criteria. On the basis of an assumed IBS prevalence of 48% in clerkship students who are required to perform overnight call, and 31% in the preclinical students who do not participate in overnight call shifts, a required sample size of at least 107 participants was calculated in each group to detect a difference with a prespecified alpha level of 5% and statistical power of 80%. The estimate of IBS prevalence was based on the prevalence of IBS symptoms of 31.3% in nurses working permanent day shifts versus 48% in nurses working rotating day and night shifts (29). Comparisons of continuous variables were made using the Student's *t* test. Comparisons of categorical variables between groups were made using the χ^2 test. All analyses were performed using PASW version 18 (SPSS, IBM Corporation, USA).

RESULTS

Medical student response rates

Of the 608 medical students enrolled in preclinical studies (n=314) or clerkship (n=294) at The Schulich School of Medicine and Dentistry, 247 (40.6%) completed, in part or whole, the web-based survey. Of these, 19 were excluded: 11 because they had not specified their year of study, three (three preclinical and 0 clerkship) because they had previous gastrointestinal diagnoses (two students with inflammatory bowel disease and one student with lactose intolerance), and five (four preclinical and one clerkship) students because they did not complete the Rome III criteria. Of the remaining completed surveys, there were 110 preclinical students (35.0% response rate) and 118 clerkship students (40.1% response rate) (Table 1). Students with pre-existing IBS were not excluded from the analysis (three preclinical and four clerkship students). Of the seven students who reported pre-existing IBS, three students (one preclinical and two clerkship students) did not have IBS according to the Rome III criteria.

Clerkship students were a mean 1.6 years older than the preclinical students, with men outnumbering women in both groups. All of the core clerkship rotations were represented in the clerkship student group, with the majority enrolled in internal medicine and family medicine, followed by surgery.

Prevalence of IBS

The prevalence of IBS in preclinical versus clerkship students was not significantly different. Twenty-one of 110 (19.1%) preclinical students and 22.0% (26 of 118) of the clerkship students surveyed had IBS based on the Rome III criteria (P=0.58).

There was no increased rate of IBS in clerkship students who were in rotations requiring heavier call schedules (internal medicine, surgery and obstetrics/gynecology) versus those in rotations with a fewer, lighter or no overnight call burden (family medicine, psychiatry, pediatrics and others including electives) (22.4% [11 of 49] versus 17.2% [10 of 58]) (P=0.50).

Impact of gastrointestinal symptoms on quality of life

Of the participating preclinical and clerkship students who fulfilled the criteria for IBS, the preclinical and clerkship students had a similar quality of life secondary to their IBS, based on the validated IBS-QOL score (33). The mean (± SD) IBS-QOL score of participants with IBS was not statistically different between preclinical (43.5±8.3) and clerkship students (45.7±13.8) (P=0.53).

DISCUSSION

Sleep disruption is an important risk factor for IBS (26-28). Three studies found that nurses who work rotating shifts have more IBS and gastrointestinal symptoms (29-31), either related to sleep disturbance (30,31) or to disruption of circadian rhythm (29). Our study was the first to investigate the relationship between overnight call and IBS in medical students. We hypothesized that the prevalence of IBS would be greater in clerkship students who are required to participate in overnight call and lower in the preclinical students who have no overnight call requirements. Our findings, however, suggest that the presence of IBS was not significantly different between the two groups. The quality of life secondary to IBS, as measured by the IBS-QOL questionnaire, was also not significantly different between preclinical and clerkship medical students with IBS.

Studies investigating the association between sleep disruption and functional bowel disorders have reported conflicting results. Previous work reported a higher prevalence of gastrointestinal symptoms among persons working night shifts when compared with those working day shifts (27,34-37). Another study found that patients with functional dyspepsia, but not those with IBS, reported sleep disturbances more frequently than healthy control subjects (26). Two previous studies examined the prevalence of functional bowel disorders among people working rotating shifts (29,31). Both studies found that people working shifts had a higher prevalence of functional bowel disorders. Using logistic regression analysis, however, this relationship was found to be independent of sleep quality (29). In contrast, in another study using polysomnography, patients with IBS were found to experience impaired sleep quality, reduced slow-wave sleep activity and significant sleep fragmentation (28).

There was no significant difference in IBS-related quality of life, as determined by the IBS-QOL questionnaire, between preclinical students and clerkship students who met the criteria for IBS.

There are several limitations to our study that must be taken into account when interpreting the results. First, our survey was completely voluntary, which can lead to selection biases. Second, the overall response rate was relatively low (40.6%), which raises concerns about how representative the participants were of medical students in general. A power calculation yielded a per-group sample size of 107. However, the prevalence of IBS in the present study was much lower than was previously estimated. This raises the issue of adequate statistical power and the possibility of type 2 error in the present study. As in any observational study, there may have been unmeasured confounders. We had no information regarding medications, diet, stress levels, physical activity, the actual number of calls, patterns and quality of sleep, and surgical history including abdominal surgeries. We had limited information on medical history, only excluding medical students who had been previously diagnosed with a gastrointestinal disorder.

SUMMARY

Our findings suggest that medical students participating in overnight call shifts do not demonstrate an increase in the prevalence of IBS compared with those not participating in overnight call shifts. More research is required to further understand the impact of overnight call shifts on gastrointestinal disease, specifically IBS.

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