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

Malcolm Wells MD, Lee Roth MD FRCPC, Morgan McWilliam BSc, Kim Thompson BMSc, Nilesh Chande MD FRCPC

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

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).

©2012 Pulsus Group Inc. All rights reserved
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 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 χ² 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 one 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).

**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 χ² test. All analyses were performed using PASW version 18 (SPSS, IBM Corporation, USA).

**TABLE 1**

Study population demographics

<table>
<thead>
<tr>
<th></th>
<th>Preclinical (n=110)</th>
<th>Clerkship (n=118)</th>
<th>Overall (n=228)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, years</td>
<td>24.1±3.2 (79)</td>
<td>25.7±1.6 (94)</td>
<td>25.0±2.1 (173)</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>54 (49.1)</td>
<td>50 (42.4)</td>
<td>104 (47.7)</td>
</tr>
<tr>
<td>Male</td>
<td>55 (50.0)</td>
<td>58 (49.2)</td>
<td>113 (51.8)</td>
</tr>
<tr>
<td>Current clerkship rotation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not applicable or preclinical students</td>
<td>107 (97.3)</td>
<td>16 (13.5)</td>
<td>126 (57.8)</td>
</tr>
<tr>
<td>Internal medicine</td>
<td>22 (18.6)</td>
<td>22 (18.6)</td>
<td>22 (10.1)</td>
</tr>
<tr>
<td>Surgery</td>
<td>19 (16.1)</td>
<td>19 (8.7)</td>
<td>22 (10.1)</td>
</tr>
<tr>
<td>Psychiatry</td>
<td>12 (10.2)</td>
<td>12 (5.5)</td>
<td>22 (10.1)</td>
</tr>
<tr>
<td>Family medicine</td>
<td>22 (18.6)</td>
<td>22 (18.6)</td>
<td>22 (10.1)</td>
</tr>
<tr>
<td>Obstetrics/gynecology</td>
<td>8 (6.8)</td>
<td>8 (6.8)</td>
<td>8 (3.7)</td>
</tr>
<tr>
<td>Pediatrics</td>
<td>8 (6.8)</td>
<td>8 (6.8)</td>
<td>8 (3.7)</td>
</tr>
</tbody>
</table>

Data presented as n (%) unless otherwise indicated
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.

ACKNOWLEDGMENTS: The authors thank George K Degnon, the executive director of the Rome foundation and the rest of the board of directors of the Rome foundation for kindly allowing use of the Rome III questionnaire for this study. They also thank Dr DL Patrick, Dr D Drossman and the MAPI Research Trust for kindly allowing use of the IBS-QOL questionnaire for this study, and Jane Turner for help in collecting the responses.

REFERENCES

Submit your manuscripts at http://www.hindawi.com