

GASTROINTESTINAL DISORDERS AMONG SHIFT WORK NURSES AT A GOVERNMENTAL HOSPITAL, ZAGAZIG CITY.

By

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Abstract

Introduction: Disruption of biological rhythms as a result of shift work has been associated with gastrointestinal (GIT) symptoms such as abdominal discomfort, diarrhea or constipation. **Aim of work:** To determine the magnitude of gastrointestinal disorders and its possible risk factors among shift work nurses. **Materials and methods:** a cross sectional study was conducted among (163) nurses at Al-Ahrar hospital, the studied nurses was classified into shift work (112) and non-shift work (day workers) (51) groups. Data collection: a questionnaire composed of 2 parts; a) Part one: includes socio-demographic and work characteristics data; b) Part two: Gastrointestinal Symptom Rating Scale (GSRs) questionnaire. **Results:** the prevalence of gastrointestinal disorders among shift work nurses was (72.3%) compared to (52.9%) of non-shift work group with statistically significant differences. Reflux syndrome was a prevalent gastrointestinal disorder among shift work group that reported by (50%) of them compared to 15.7% of non-shift work group. Also indigestion syndrome was higher among shift work group than non-shift group (30.4% and 15.7%) with statistically significant differences. Gastrointestinal Symptom Rating Scale (GSRs) score was 0.73 ± 0.33 in shift work group, compared with a mean score of 0.59 ± 0.42 among non-shift work group with statistically significant differences ($p < 0.02$). Consumption of coffee and tea more than 3 cups per day and non-fixed shifts per month increase the risk of gastrointestinal tract disorders among shift-work nurses (OR= 3.34 and 2.69 respectively). **Conclusion:** Participation in shift work, especially rotating and non-fixed shifts is associated with the development of gastrointestinal disorders. It is recommended that fixed shifts per month decrease the risk of developing GIT disorders. **Key words:** Gastrointestinal disorders, Shift work, Risk factors, Gastrointestinal Symptom Rating Scale and Nurses

Introduction

Shift work is defined as a variety of working hour's arrangements, including working outside daytime hours such as night shifts, overtime work and rotational or irregular work patterns. Conclusively, it is a system in which staffs are required to work a combination of day, afternoon and night shift (Nazatul et al., 2008).

Shift workers often experience circadian disturbance, especially when they are working overnight or in rotating shifts; shift work schedules are associated with increased risk of accidents and injuries (Barger et al., 2006)). Personnel who work during the evenings and at night experience disruptions in circadian rhythms, which may aggravate fatigue. Fatigue may contribute to the human error part of medical errors (Czeisler et al., 2005).

Meal times are important synchronizers of the human life, having both social and physiological aspects. Although shift workers cannot significantly modify their total energy intake, they change the timing and frequency of eating and, sometimes, the content of meals (more

fats and carbohydrates in many cases) (Lennernäs et al., 1994)

Digestive troubles are most frequently complained of shift workers (20-75% compared with 10-25% of non-shift workers), due to the troubles being due to phase displacements between times of meals and normal circadian phases of gastrointestinal functions which include gastric, bile and pancreatic secretions, intestinal motility, enzyme activity, hunger and satiety hormones, rate of absorption of nutrients and to changes in food quality and composition (Lennernäs et al., 1994 and Hoogerwerf , 2006).

Many surveys document that gastrointestinal troubles and diseases are more common among shift workers than in day workers. They can vary from alterations in bowel habits, digestion difficulties, and flatulence, to more severe disorders such as gastro-duodenitis, irritable bowel syndrome, and peptic ulcer (Knutsson, 2003 and Nakata et al., 2004).

A Japanese study on peptic ulcers covering about 12000 workers from several sectors, diagnosis was done by combined X-ray and endoscopy

found that a double in the relative risk of peptic ulcers among shift workers than in non-shift workers (2.38% vs. 1.03% for gastric ulcer and 1.37% vs. 0.69% for duodenal ulcer) (Segawa et al., 1987).

Chronic disruption of biological rhythms due to shift work has been associated with the development of serious gastrointestinal disease. A study among nurses showed that nurses who worked at least three rotating night shifts per month for 15 years or more had a significantly greater risk of developing colorectal cancer compared to women who never worked rotating night shifts (Schernhammer et al ., 2003).

Moreover, some studies reported that the infection by H-Pylori is more prevalent among shift workers than in day workers, which probably is a sign that shift work hampers the natural gastric defense (Pietrojusti et al., 2006).

A systematic review, reporting an association between shift work and GIT diseases, reported that four out of six studies demonstrated a statistically significant association with digestive symptoms, two out of three with functional GI disorders and five out of

six with peptic ulcers (Knutsson and Bøggild 2010).

Many studies have reported a higher prevalence of nutritional and metabolic disturbances among shift workers, as overweight , obesity ,increased tryglycerides and total cholesterol blood levels in shift workers engaged in night work, that emphasizing its role in the pathogenesis of coronary heart disease (Lin et al 2009 and Lowden et al ., 2010).

Aim of work

To determine the magnitude of gastrointestinal disorders and its possible risk factors among shift work nurses.

Materials and methods

- **Study design:** a cross-sectional study
- **Place and duration of study:** The study was conducted among nurses in Al Ahrar governmental hospital over the period from October 2015 to April 2016.
- **Study Sample:** The target population was nurses working at Al Ahrar governmental hospital. The Sample size was calculated

by using Epi-info. According to the statistical records of Al Ahrar governmental hospital, the total number of nurses at the year 2015 was (675)nurses, with expected frequency of gastrointestinal disorders among shift workers was 83 % (Hamid and Ali, 2010) at confidence interval 95%, with study power was 80%. Accordingly, the total calculated sample size was (181) nurses. Stratified random sampling technique was used for selection of nurses. Different units and departments at Al Ahrar governmental hospital were classified into 4 main strata had nearly the same working conditions; 1) outpatient clinics 2) surgical departments, 3) internal medicine and pediatrics departments, and 4) intensive care, and emergency departments. One hundred and sixty three (163) questionnaires were completed after excluding incompletely filled questionnaires. The studied nurses were classified into shift work group (112) and non-shift work (day workers) group (51).

Inclusion criteria: nurses either males or females who were working at least for one year.

Exclusion criteria: nurses had gastrointestinal disorders before starting work.

Study methods:

A self-administered questionnaire that involved information about:

I-The first part: socio-demographic and work-related characteristics that included age, gender, marital status, duration of work, type of work (non-shift, fixed shifts/month or non-fixed shifts/month) and consumption of tea and coffee/day.

II-The second part: Gastrointestinal Symptom Rating Scale (GSRS) questionnaire. The GSRS questionnaire is a validated, self-administered questionnaire, which assess severity of GI symptoms using a 4-point Likert scale in five domains:

1. Abdominal pain (abdominal pain, hunger pains and nausea).
2. Reflux syndrome (heartburn and acid regurgitation).
3. Diarrhea syndrome (diarrhea,

loose stools and urgent need for defecation).

4. Indigestion syndrome (abdominal distension, eructation and increased flatus).
5. Constipation syndrome (constipation, hard stools and feeling of incomplete evacuation).

The severity of symptoms reported in the GSRS increases with increasing score. Score ≥ 2 indicate positive symptoms.

Consent

Informed verbal consent was taken before data collection. Questionnaires were coded numerically to confirm the confidentiality of participants.

Ethical approval

Ethical permission was obtained from the hospital administration to conduct the study prior to data collection. Before carrying out the study, Institutional Review Board (IRB) of the faculty of Medicine, Zagazig University approved the study protocol.

Data management

For the data entry and statistical analysis, Statistical Package for the Social Sciences (SPSS) version 21 for Windows was used for frequency distribution tables, mean and standard deviation for descriptive purposes, chi-square and fisher exact for testing the significance of difference of qualitative variables. The level of significance was considered at < 0.05 .

Results

Table (1): Socio-demographic and work characteristics of shift and non-shift work nurses.

Variables	Non-shift work group (No= 51)		Shift work group (No= 112)		Total (No= 163)		p	OR (CI 95%)
	No	%	No	%	No	%		
Age (years)								
<30	19	37.3	53	47.3	72	44.2	>0.05	0.66 (0.33-1.3)
>30	32	62.7	59	52.7	91	55.8		
X± SD	35.72±8.65		34.24±10.92		34.7±10.2		>0.05	-
Sex								
Male	2	3.9	9	8	11	6.7	>0.05	0.46 (0.09-2.24)
Female	49	96.1	103	92	152	93.3		
Age (years)								
<10	24	47.1	55	49.1	79	48.5	>0.05	0.92 (0.47-1.78)
>10	27	52.9	57	50.9	84	51.5		
X± SD	12.27±7.89		13.16±11.1		12.8±10.26		>0.05	-
Residence								
Rural	34	66.7	83	74.1	117	71.8	>0.05	0.69 (0.34-1.43)
Urban	17	33.3	29	25.9	46	28.2		
Marital status								
Single	9	17.6	28	25	37	22.7	>0.05	0.64 (0.27-1.48)
Married	42	82.4	84	75	126	77.3		
Chronic diseases								
No	46	90.2	97	86.6	143	87.7	>0.05	1.42 (0.48-4.15)
Yes	5	9.8	15	13.4	20	12.3		
Consumption of coffee and tea								
< 3 cups /day	23	45.1	45	40.2	68	41.7	>0.05	1.22 (0.62-2.38)
≥3 cups /day	28	54.9	67	59.8	95	58.3		

Table (1) demonstrates that the majority of participants (93.3%) were females. 55.8% of participants were above 30 years with mean age of (34.7±10.2) and mean current job duration (12.8±10.26). Regarding residence, 71.8% of participants live in rural areas and 77.3% are married. Regarding the chronic diseases 12.3% of them had chronic diseases. There was no statistically significant difference between non-shift work and shift work group regarding age, sex, work duration, residence marital status and having chronic diseases.

Table (2): Frequency distribution of gastrointestinal disorders among shift and non-shift work nurses.

Variables	Non-shift work group (No= 51)		Shift work group (No= 112)		Total (No= 163)		p	OR (CI 95%)
	No	%	No	%	No	%		
No	24	47.1	31	27.7	55	33.7	>0.05	2.32 (1.16-4.62)
Yes	27	52.9	81	72.3	108	66.3		
Abdominal pain								
No	33	64.7	63	56.3	96	58.6	>0.05	1.42 (0.71-2.82)
Yes	18	35.3	49	43.7	67	41.4		
Reflux syndrome								
No	43	84.3	56	50	98	60.5	<0.05*	5.37 (2.31-12.45)
Yes	8	15.7	56	50	64	39.5		
Diarrhea syndrome								
No	45	88.2	104	92.9	148	91.4	>0.05	0.57 (0.18-1.75)
Yes	6	11.2	8	7.1	14	8.6		
Indigestion syndrome								
No	43	84.3	78	69.6	121	74.2	<0.05*	2.34 (1.1-5.51)
Yes	8	15.7	34	30.4	42	25.8		
GSR score								
No	44	86.3	94	83.9	138	84.7	>0.05	1.2 (0.46-3.09)
Yes	7	13.7	18	16.1	25	15.3		
X± SD	0.59±0.42		0.73±0.33		0.69±0.37		<0.05*	-

*: Significant

GSR: Gastrointestinal Symptom Rating Scale

Table (2) showed that the overall prevalence of gastrointestinal disorders among shift work group was (72.3%) compared to 52.9% of non-shift work group with statistically significant differences. Reflux syndrome was the most prevalent gastrointestinal disorders among shift work group that reported by (50%) of them compared to 15.7% of non-shift work group (statistically significant). Also indigestion syndrome was higher among shift work group than non-shift group (30.4% and 15.7%) with statistically significant differences. Gastrointestinal Symptom Rating Scale (GSRS) score was 0.73 ± 0.33 in shift work group, as compared with a mean score of 0.59 ± 0.42 among non-shift work group with statistically significant differences ($p<0.02$).

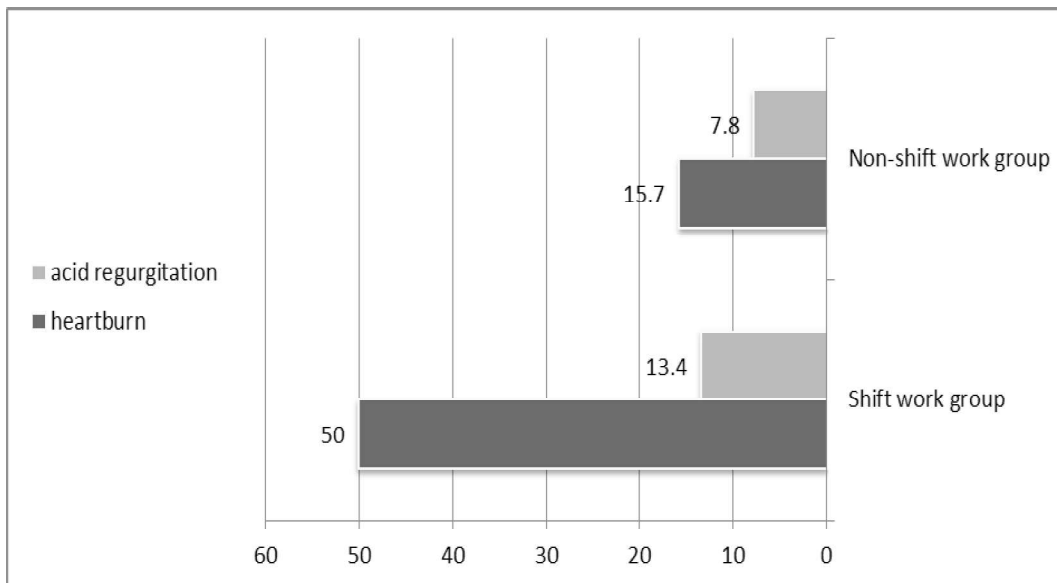


Fig. 1: Percentage distribution of Reflux Syndrome components (acid regurgitation and heartburn) among shift and non-shift work nurses.

Figure (1) revealed that heartburn was higher among shift work group than non-shift work group (50% and 15.7 respectively), while the prevalence of acid regurgitation among both groups were low.

Variables	Prevalence of GIT disorders among shift-work group		X ²	P	OR (CI 95%)
	No	%			
Age (years)					
<30 (53)	39	73.58	0.08	>0.05	0.88 (0.38-2.03)
>30 (59)	42	71.18			
Sex					
Male (9)	9	100	3.7	>0.05	-
Female 103)	72	69.9			
Work duration (years)					
<10 (55)	41	74.54	0.26	>0.05	0.80 (0.35-1.84)
>10 (57)	40	70.17			
Residence					
Rural (83)	61	73.49	0.22	>0.05	0.8 (0.31-2.02)
Urban (29)	20	68.96			
Marital status					
Single (28)	19	67.85	0.37	>0.05	1.33 (0.52-3.38)
Married (84)	62	73.8			
Chronic diseases					
NO (97)	70	72.16	0.09	>0.05	1.06 (0.31-3.62)
Yes (15)	11	73.33			
Consumption of coffee and tea					
< 3 cups /day (45)	26	57.77	7.94	<0.05*	3.34 (1.41-7.91)
≥3 cups /day (67)	55	82.08			
Fixed shifts per month					
Yes (39)	23	58.97	5.32	<0.05*	2.69 (1.14-6.31)
No (73)	58	79.45			

*: Significant

Table (3) showed that consumption of coffee and tea more than 3 cups per day and non-fixed shifts per month increase the risk of gastrointestinal tract disorders among shift-work nurses (OR= 3.34 and 2.69 respectively). There is no association between gastrointestinal tract disorders among shift-work nurses in relation to age, sex, work duration, residence, marital status and the presence of chronic diseases.

Discussion

In many studies, it has been observed that disruption of biological circadian rhythm is more common among rotating shift workers predisposing them to subjective symptoms like: increased fatigue, anorexia and sleep disturbances as well as problems with gastrointestinal system (Kim et al., 2002 and Lu et al., 2005).

In our study the overall prevalence of gastrointestinal disorders among shift work nurses was (72.3%) compared to 52.9% of non-shift work nurses with statistically significant differences (Table 2). The causes of this difference could be due to many factors such as sleep disorders (Fass et al., 2000 and Rotem et al., 2003), inappropriate nutrition and irregularity in meals time (Bilski, 2006), also mental and psychological disorders factors (Zhen and Gwee, 2006). Similar findings were reported by Scott, (1994) that 75% of gastrointestinal complaints were among night-workers. This proportion was much higher than that reported in a previous study in Korea (42%) (Yoo, 1994). It was lower than that reported by Hamid and Ali, (2010) who found

that the prevalence of complaints of at least one GI symptom was (81.9%) among shift-workers and they justify their findings by that could be due to different environmental factors, social factors, hospital organization, inordinate hours of working or insufficient welfare facilities.

Our study revealed that shift work was associated with increase the risk of GI disorders OR= 2.32(1.16-4.62) (Table 2). Similar findings reported by Prunier-Poulmaire et al, (1998) that evening shifts were associated with a three folds increase in the risk of a gastrointestinal diagnosis.

Reflux syndrome was the most prevalent gastrointestinal disorders among shift work group that reported by (50%) of them compared to 15.7% of non-shift work group with (OR=5.37, 95% CI 2.31-12.45) (Table 2). Also indigestion syndrome was higher among shift work group than non-shift group (30.4% and 15.7%) with statistically significant differences (Table 2).

Li et al., (2008) carried out a cross-sectional study among nurses at ten hospitals in China. Multivariate logistic regression analysis showed that night

shift work was significantly associated with Gastrointestinal Symptom Rating Scale (GERD) (OR 1.38, 95% CI 1.11–1.71).

The present study revealed, there were no statistically significant differences between both groups regarding diarrhea syndrome and constipation syndrome. However, Bilski (2006) reported that defecation irregularity was more prevalent GIT complaint among shift-work nurses and the frequency of other complaints, such as non-specific pains, diarrhea and gastric ulcers did not differ from that in non-shift work nurses.

Consumption of coffee and tea more than 3 cups per day and non-fixed shifts per month increase the risk of gastrointestinal tract disorders among shift-work nurses (OR= 3.34 and 2.69 respectively) (Table 3). Bercz and Jaffe, (2012) reported that other proposed factors in the association of GIT illness with shift work include the increased uses of caffeine, tobacco, and alcohol by shift workers as a coping mechanism.

In our study we observed that, there is no association between gastrointestinal tract disorders among shift-work

nurses in relation to age, sex, work duration, residence, marital status and the presence of chronic diseases which was in accordance with the finding of Nojkov et al, (2010) that no association was found between the number of years of practice and GIT disorders. Possible explanation for that, as increased the number of years of practice, the colon could adapt without compromising its motility, which was different from Hamid and Ali, (2010) who noticed that gastrointestinal symptoms were higher among nurses under (40) years of age ($p = 0.01$). The age effect was also reported by Zhen et al, (2006) and they explained it by aging is expected to make people more prone to GI disorders, but also younger nurses are likely to volunteer to work more than the average working hours or work on irregular shifts. Akere and Akande, (2014) observed that shift work nurses with less than 5 years of practice experiences had a high risk of developing functional GI disorders.

Conclusion

Participation in shift work, especially rotating and non-fixed shifts are associated with the development of gastrointestinal disorders. It is

recommended that fixed shifts per month may decrease the risk of developing GIT disorders.

Conflict of interest

The authors declare that there is no conflict of interests.

References

1. Akere A and Akande KO (2014): Association between Irritable Bowel Syndrome and Shift Work: Prevalence and Associated Factors among Nurses. *Journal of Gastroenterology and Hepatology Research*; 3(11): 1328-31.
2. Barger LK, Ayas NT, Cade BE, Cronin JW, Rosner B and Speizer FE (2006): Impact of extended duration shifts on medical errors, adverse events, and attentional failures. *PLoS Medicine*; 3 (12): 1–10.
3. Bercz P A and Jaffe F (2012): Adverse health effects of shift work and shift work sleep disorder. *Dialogue and Diagnosis*; 3: 13-20.
4. Bilski B (2006): Influence of shift work on the diet and gastrointestinal complains among nurses; a pilot study. *Med Pr*; 57(1):15–9.
5. Caruso CC, Lusk SL and Gillespie BW (2004): Relationship of work schedules to gastrointestinal diagnoses, symptoms, and medication use in auto factory workers. *Am J Ind Med*; 46(6): 586-98.
6. Czeisler CA, Walsh JK, Roth T, Hughes RJ, Wright KP and Kingsbury L (2005): Modafinil for excessive sleepiness associated with shift work sleep disorder. *New England Journal Medicine*; 353 (10): 1078.
7. Fass R, Fullerton S, Tung S and Mayer EA (2000): Sleep disturbances in clinic patients with functional bowel disorders. *Am J Gastroenterol*; 95:1195–1200.
8. Hoogerwerf WA (2006): Biological clocks and the gut. *Curr Gastroenterol Rep*; 8:353–9.
9. Knutsson A (2003): Health disorders of shift workers. *Occup Med (Lond)*; 53: 103–108.
10. Knutsson A and Bøggild H (2010): Gastrointestinal disorders among shift workers. *Scand J Work Environ Health*; 36: 85–95.
11. Kim YG, Yoon DY, Kim JI, Chae CH, Hong YS, et al (2002): Effects of Health on Shift-Work: General and Psychological Health, Sleep, Stress, Quality of life. *Korean J Occup Environ Med*; 14(3): 247-256.
12. Lennernäs M, Hambræus L, Åkersted T (1994): Nutrient intake in day and shift workers. *Work and Stress*; 8: 332–342.
13. Lin YC, Hsiao TJ and Chen PC (2009): Persistent rotating shift-work exposure accelerates development of metabolic syndrome among middle-aged female employees: a five-year follow-up. *Chronobiol Int*; 26: 740–755.
14. Lowden A, Moreno C, Holmback, Lennernas M and Tucker P (2010): Eating and shift work - effects on habits, metabolism and performance. *Scand J Work Environ Health*; 36:150–162.
15. Lu WZ, Gwee KA, Moochhalla S and Ho KY (2005): Melatonin improves bowel symptoms in female patients with irritable bowel syndrome: a double –blind placebo-controlled study. *Aliment Pharmacol Ther*; 22: 927-934.
16. Nakata A, Haratani T, Takahashi M, Kawakami N, Arito H et al (2004): Association of sickness absence with poor sleep and depressive symptoms in shift workers *Chronobiol Int*; 21: 899–912.
17. Nazatul SM, Saimy I and Moy FM (2008): Prevalence of sleep disturbance among nurses in a Malaysian government hospital and its association with work characteristics. *JUMMEC*; 11 (2): 66-71.
18. Nojkov B, Rubenstein JH, Chey WD and Hoogerwerf WA (2010): The Impact of Rotating Shift Work on the Prevalence of Irritable Bowel Syndrome in Nurses. *Am J Gastroenterol*; 105(4): 842-847.

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19. Pietroiusti A, Forlini A, Magrini A, Galante A, Coppeta L and Gemma G (2006): Shift work increases the frequency of duodenal ulcer in H pylori infected workers. *Occup Environ Med*; 63: 773–775.
 20. Prunier-Poulmaire S, Gadbois C and Volkoff S (1998): Combined effects on shift systems and work requirements on customs officers. *Scand J Work Environ Health*; 24 (3):134–40.
 21. Rotem AY, Sperber AD, Krugliak P, Freidman B, Tal A, et al (2003): Polysomnographic and actigraphic evidence of sleep fragmentation in patients with irritable bowel syndrome. *Sleep*; 26:747–752.
 22. Segawa K, Nakazawa S, Tsukamoto Y, Kurita Y, Goto H et al (1987) : Peptic ulcer is prevalent among shift workers. *Dig Dis Sci*; 32: 449–453.
 23. Schernhammer ES, Laden F and Speizer FE (2003): Night-shift work and risk of colorectal cancer in the nurses' health study. *J Natl Cancer Inst*; 95:825–8.
 24. Scott AJ (1994): LaDou. In: *Occupational Medicine*. 3. Zenz C, Dickerson OB, Horvath EP, editor. St Louis, MO (USA): Mosby; Health, safety in shift workers; Pp. 960–986.
 25. Yoo KH (1994): Sleeping Patterns and Gastrointestinal Disorders According to the Shift Works in Female Textile Workers. *Korean J Prev Med*; 27(1):74–83.
 26. Zhen Lu W, Ann Gwee K and Yu Ho K (2006): Functional bowel disorders in rotating shift nurses may be related to sleep disturbances. *Eur J Gastroenterol Hepatol*; 18(6):623–7.