

CARDIOVASCULAR RISKS AMONG SHIFT AND NON-SHIFT WORKERS IN A PUBLIC MEDICAL CENTRE IN KUALA LUMPUR

Moy FM¹, Hoe VCW¹, Tan CPL², Rosmawati M³

¹ Julius Centre University of Malaya, Department of Social & Preventive Medicine, Faculty of Medicine, University of Malaya, Kuala Lumpur, Malaysia.

² Department of Primary Care Medicine, Faculty of Medicine, University of Malaya, Kuala Lumpur, Malaysia.

³ Dean's Office, Faculty of Medicine, University of Malaya, Kuala Lumpur, Malaysia.

ABSTRACT:

Night work and rotating shift work are found to be detrimental to the health of workers. A cross sectional analytical study was conducted among the employees of a public medical centre in Kuala Lumpur. A total of 380 employees participated in the health screening and questionnaire survey. The majority of the respondents were Malays, females, and with mean age of 49 years old. The shift workers persistently had higher but non-significant proportions of being overweight/obesity and unhealthy clinical indicators such as systolic and diastolic blood pressure, fasting blood glucose and lipid profile except waist circumferences and HDL-cholesterol. There were also slightly more shift workers diagnosed with diabetes mellitus, hypertension or coronary heart disease ($p>0.05$). Although the present study could not provide established evidence for a relationship between shift work and cardiovascular risks, this could serve as a pilot study for future studies in this area. (*JUMMEC 2010; 13 (1): 45-49*)

KEYWORDS: *shift work, cardiovascular risks*

Introduction

Shift work is an employment practice designed to make use of the 24 hours of the clock, rather than a standard working day. The term shift work includes both long-term night shifts and work schedules in which employees change or rotate shifts (1). Night work and rotating shift work disrupt the circadian timing system. This disruption may produce significant deleterious symptoms in some workers. Certain medical conditions may be aggravated by shift-work scheduling, and shift workers are at increased risk of experiencing cardiovascular, gastrointestinal, and reproductive dysfunction (2-4). However, shift work is a requirement of nursing and essential health workers to provide patients with optimum levels of continuous care in health care settings.

Shift work has been associated with an increased risk of cardiovascular disease (CVD). Findings showed that non-day workers had a relative risk (RR) for all circulatory diseases of 1.31 (95% CI 1.06-1.63) compared to day workers (5). The increased risk of CVD associated with shift work is related to the greater incidence of Metabolic Syndrome (MetS) among these workers. The metabolic syndrome incidence

was found to be significantly higher in shift workers than in other workers (OR: 4.10, 95% CI 1.34-12.55) who were healthy at baseline (6). The MetS incidence rate among shift workers (60.6 per 1000 person-years) was increased in comparison with day workers (37.2 per 1000 person-years) with an odds ratio (95% CI) of 1.77 (1.34-2.32) (7). A study by Copertaro *et al* (8) showed a high prevalence of metabolic syndrome detected among shift workers. The above could be explained by evidence that a significant relation was found between years of working nights (more than 10 years) and high cholesterol values (RR=2.58; CI=1.07-6.27) (9). Positive relationship was also observed between BMI and waist to hip ratio (WHR) and duration of shift work experience, with an adjustment for age (10).

Correspondence:

Moy Foong Ming

Department of Social & Preventive Medicine

Faculty of Medicine

University of Malaya

50603 Kuala Lumpur, Malaysia

Email: moyfm@ummc.edu.my

Therefore, a study should be conducted among all employees of hospitals or medical centres to investigate the relationship of shift work with health particularly cardiovascular risks. This paper attempts to explore the association of shift work with the cardiovascular risks among employees of a public medical centre in Kuala Lumpur.

Materials and methods

This was a cross-sectional study conducted in 2005 to 2006. Universal sampling was conducted where all employees aged 40 years and above of the university's medical centre were invited to participate in the health screening and questionnaire survey. Ethics clearance was obtained from the Ethics Committee of the medical centre that governed all studies involving humans. Informed consent was obtained from all respondents.

All respondents were required to fast overnight for the screening of biochemical indicators including lipid profile (total cholesterol, triglycerides, HDL-cholesterol, LDL-cholesterol) and fasting blood glucose. Venous blood was obtained following standard procedures by medical officers of the staff health clinic from the medical centre. All analyses of blood samples were conducted by the Clinical Diagnostic Laboratory of the same medical centre.

Anthropometric measurements (weight, height and waist circumference) and a self-administered questionnaire survey were also conducted. The questionnaire was pre-tested and enquired on

socio-demographic characteristics, medical history, occupational history (work in shifts, overtime, job satisfaction etc).

All data was entered and analysed by SPSS for windows version 15.0. Appropriate statistical analysis was conducted and the significant level was preset at 0.05.

Results

Out of a total of 1,007 workers who had undergone the health screening, only 380 responded to the questionnaire survey (response rate of about 38%). Although the response rate was less than satisfactory, there was no significant difference observed between respondents and non-respondents (Table 1).

Out of the 380 respondents, only 112 (29.5%) of them worked on shifts. Shift work in this medical centre was on rotation basis with three shifts throughout the 24 hours. The three shifts were morning, afternoon and night shifts. The mean number of night shifts for the respondents was 3.56 ± 2.18 per month. There was no significant difference in race, gender, marital status, education level and age among the shift and non-shift workers (Table 2). Both groups were predominantly Malay, female and married with secondary education. The mean age of both groups was about 49 years old. Respondents working as nurses and security staff comprise the majority of the shift workers.

There was no significant difference in the mean BMI, systolic and diastolic blood pressure, fasting blood

Table 1: Comparison of respondents and non-respondents

		Respondents (n=380) n (%)	Non-respondents (n=627) n (%)	p-value
Race	Malay	313 (82.3)	496 (79.1)	0.652
	Chinese	27 (7.1)	52 (8.3)	
	Indian	39 (10.3)	78 (12.4)	
	Others	1 (0.3)	1 (0.2)	
Gender	Male	122 (32.2)	232 (36.9)	0.126
	Female	258 (67.8)	395 (63.1)	
Age (years)	mean + s.d.	49.40 \pm 4.80	49.96 \pm 5.22	0.09
BMI (kg/m²)	mean + s.d.	27.06 \pm 5.00	27.00 \pm 4.91	0.85

Table 2: Socio-demographic characteristics of shift and non-shift workers

		Shift workers (n=112) n (%)	Non-shift workers (n= 268) n (%)	p-value
Race	Malay	92 (82.1)	221(82.5)	0.193
	Chinese	5 (4.5)	22 (8.2)	
	Indian	14 (12.5)	25 (9.3)	
	Others	1 (0.9)	0 (0.0)	
Gender	Male	40 (35.7)	82 (30.6)	0.393
	Female	72 (64.3)	186 (69.4)	
Marital Status	Married	104 (92.9)	233 (87.5)	0.105
	Single/divorced	8 (7.1)	33 (12.5)	
Education Level	Primary	9 (8.0)	17 (6.4)	0.586
	Secondary	75 (67.0)	172 (64.7)	
	Diploma	21 (18.8)	49 (18.4)	
	Tertiary	7 (6.3)	28 (10.5)	
Occupation	Nurses	52 (46.4)	88 (32.8)	<0.001
	Medical assistants	7 (6.3)	24 (9.0)	
	Technician	5 (4.5)	37 (13.8)	
	Administrative	0 (0)	59 (22.0)	
	Security	34 (30.4)	0 (0)	
	Attendants	14 (12.5)	60 (22.4)	
Age (years)	mean \pm s.d	49.78 \pm 4.71	49.21 \pm 4.85	0.287

sugar, lipid profile except waist circumference and HDL-cholesterol between shift and non-shift workers (Table 3). However, the shift workers had persistently higher but non-significant proportions of overweight/obesity and abnormal clinical indicators as shown in Figure 1. There were also slightly more shift workers diagnosed with diabetes mellitus, hypertension or coronary heart disease but the associations were not significantly different ($p>0.05$).

Discussion

Although the response rate was unsatisfactory, the baseline socio-demographic characteristics of the respondents and non-respondents were comparable. There was also no significant difference in the socio-demographic characteristics of the shift and non-shift workers in this medical centre except the occupation status due to the nature of their work. There were more nurses and security guards who worked shift while most of the non-shift workers were in the administrative and non-critical fields.

The shift workers persistently had higher proportions of diagnosis with chronic diseases such as diabetes

mellitus, hypertension and coronary heart disease although not statistically significant different ($p>0.05$).

There was no significant difference found in their mean body mass index (BMI), systolic and diastolic blood pressure, and lipid profile among the shift and non-shift workers except waist circumferences and HDL-cholesterol ($p<0.05$). When these workers were divided into normal and abnormal groups based on all the above, the shift workers persistently had higher proportions of abnormal health indicators. These insignificant results might be due to the small sample size. Further study should be conducted on a larger sample to establish significant associations.

Although some evidences had shown that working shifts affected the health of workers (8, 11, 12), the current findings did not show significant difference between workers who worked shift and non-shift. Similar results were shown by Dochi *et al* (13) in their 14-year cohort study of 5510 male workers in a steel company. No consistent association was found between shift work and hypercholesterolemia. A study by Morikawa *et al* (14) too did not find

Table 3: Clinical indicators of shift and non-shift workers

	Shift workers Mean ± s.d	Non-shift workers Mean ± s.d	T-test p-value
BMI	27.48 ± 4.75	27.04 ± 4.90	0.424
Waist (cm)	91.38 ± 8.63	85.91 ± 12.00	0.036
Systolic blood pressure (mmHg)	119.42 ± 16.08	116.73 ± 14.07	0.108
Diastolic blood pressure (mm Hg)	72.81 ± 6.37	71.70 ± 6.37	0.124
Fasting blood sugar (mmol/l)	5.55 ± 1.73	5.58 ± 1.89	0.883
Total cholesterol (mmol/l)	5.68 ± 1.02	5.69 ± 0.89	0.900
HDL-cholesterol (mmol/l)	1.19 ± 0.31	1.29 ± 0.32	0.005
LDL-cholesterol (mmol/l)	3.79 ± 1.00	3.75 ± 0.86	0.697
Triglyceride (mmol/l)	1.65 ± 1.73	1.47 ± 1.04	0.210

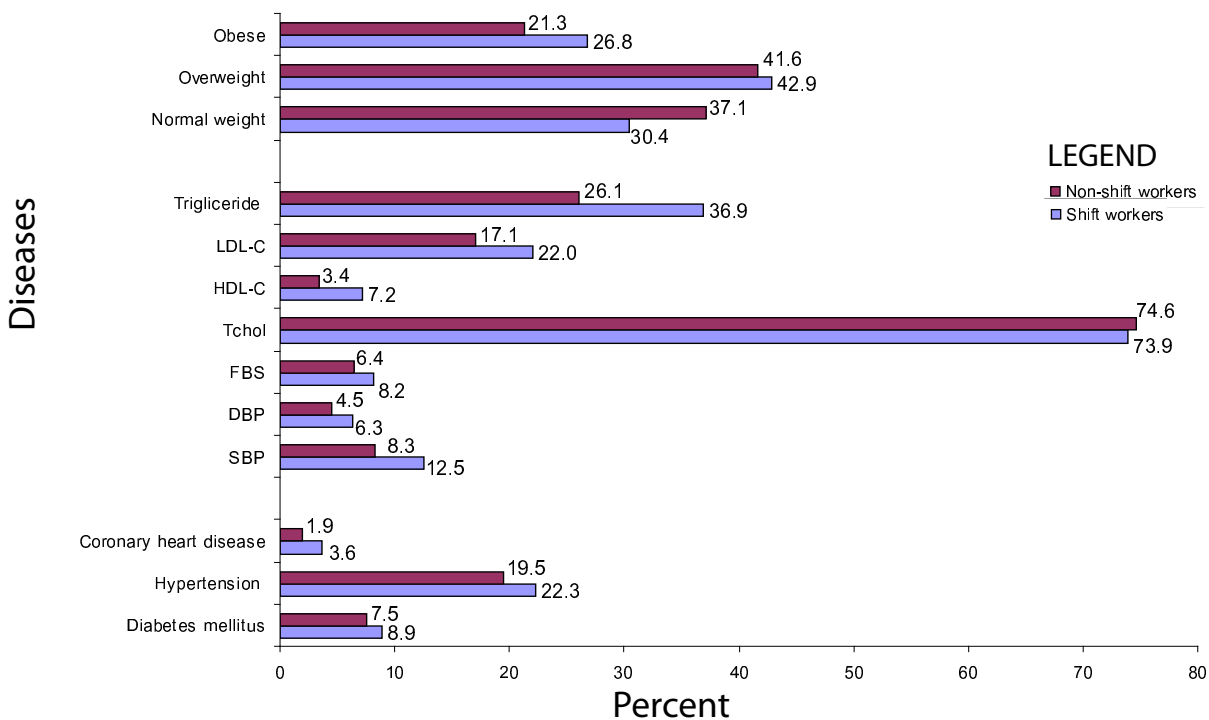


Figure 1: Proportions of abnormal BMI groups, clinical indicators and diagnosis of chronic diseases among shift and non-shift workers

significant difference in total cholesterol between daytime workers and shift workers. However, they found that shift work was considered to be a risk factor for excess weight. Another study conducted in Malaysia among factory workers showed that BMI was increased among shift workers but no significant difference found on health indicators (15). According to Sharifian *et al* (16), shift work acted as an oxidative stressor in inducing medical disorders, while aging and obesity made them more sensitive to this hazardous effect.

Therefore, shift workers' health should be safeguarded through preventive check-ups and regular controls by occupational health physicians. This might involve occupational health physicians to inform shift workers on coping strategies, and to assess health disorders (17). This "higher-risk" subgroup may benefit from targeted interventions to reduce potential adverse effects from shift work (18).

Poor response rate giving rise to a small sample size is the limitation faced by this study. Efforts such as mail

reminders and telephone calls were taken to increase response rate. However, due to the demanding nature of these health care workers, most of them declined to participate. Both the respondents and non-respondents had similar socio-demographic background, which showed that the results are still generalizable to the employees of this medical centre.

Conclusion

Although the shift workers seemed to be at higher risk for cardiovascular diseases, the present study could not provide established evidence for a relationship between shift work and cardiovascular risks. However, this could serve as a pilot study for a better designed study to be conducted in the future.

Acknowledgement

The authors would like to acknowledge the funding from the Ministry of Higher Education. Data collection by Ms Woon SC and Miss Joey Eng was also acknowledged. Last but not least, our sincere gratitude to all respondents of the study.

References

1. Monk TM, Folkard S. Making shift work tolerable 1992: CRC Press; 1992.
2. Scott AJ. Shift work and health. *Prim Care* 2000; 27(4): 1057-1079.
3. Knutsson A. Health disorders of shift workers. *Occup Med (Lond)* 2003; 53(2): 103-108.
4. Brown DL, Feskanich D, Sanchez BN, et al. Rotating Night Shift Work and the Risk of Ischemic Stroke. *American Journal of Epidemiology* 2009; 169(11): 1370-1377.
5. Tuchsén F, Hannerz H, and Burr H. A 12 year prospective study of circulatory disease among Danish shift workers. *Occup Environ Med* 2006; 63(7): 451-455.
6. La Sala M, Pietrojusti A, Magrini A, et al. (Metabolic syndrome and work: identification of populations at risk). *G Ital Med Lav Ergon* 2007; 29(3 Suppl): 445-447.
7. De Bacquer D, Van Risseghem M, Clays E, et al. Rotating shift work and the metabolic syndrome: a prospective study. *Int J of Epidemiol* 2009; 38(3): 848-854.
8. Copertaro A, Bracci M, Barbaresi M, et al. Assessment of cardiovascular risk in shift healthcare workers. *Eur J Cardiovasc Prev Rehabil* 2008; 15(2): 224-229.
9. Portela LF, Rotenberg L, and Waissmann W. Self-reported health and sleep complaints among nursing personnel working under 12 h night and day shifts. *Chronobiol Int* 2004; 21(6): 859-870.
10. van Amelsvoort LG, Schouten EG, and Kok FJ. Duration of shiftwork related to body mass index and waist to hip ratio. *Int J Obes Relat Metab Disord* 1999; 23(9): 973-978.
11. Härmä M. Shift work among women—a century-old health issue in occupational health. *J Work Environ Health* 2008; 34(1): 1-3.
12. Kroenke CH, Spiegelman D, Manson J, et al. Work characteristics and incidence of type 2 diabetes in women. *Am J Epidemiol* 2007; 165(2): 175-183.
13. Dochi M, Sakata K, Oishi M, et al. Relationship between shift work and hypercholesterolemia in Japan. *Scand J Work Environ Health* 2008; 34(1): 33-39.
14. Morikawa Y, Nakagawa H, Miura K, et al. Effect of shift work on body mass index and metabolic parameters. *Scand J Work Environ Health* 2007; 33(1): 45-50.
15. Chee HL, Mirnalini K, Maimunah K, et al. Body mass index and factors related to overweight among women workers in electronic factories in Peninsular Malaysia. *Asia Pac J Clin Nutr* 2004; 13(3): 248-254.
16. Sharifian A, Farahani S, Pasalar P, et al. Shift work as an oxidative stressor. *J Circadian Rhythms* 2005; 3: 15.
17. Garbarino S. (Shiftwork. Impact on health and safety in the working environment). *G Ital Med Lav Ergon* 2006; 28(1): 89-105.
18. DeMoss C, McGrail M, Jr., Haus E, et al. Health and performance factors in health care shift workers. *J Occup Environ Med* 2004; 46(12): 1278-1281.