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Abstract

Shiftwork Duration and Metabolic Risk Factors of Cardiovascular Disease

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Objectives: : To explore the relationship between shiftwork duration and metabolic risk factors on cardiovascular disease in shiftworkers.

Methods: The study subjects comprised of 226 nurses, from a hospital, and 130 male workers, from a diaper and feminine hygienic material manufacturing firm. The mean ages of the male workers and nurses were 29 and 28.5 years, respectively. The fasting blood sugar, serum cholesterol, blood pressure, height and weight, waist and hip circumferences (only in nurses), and number of step for a shift as indices of physical activity were measured. Using the Korean version of Karasek 's job contents questionnaire, the job stress was assessed. Information about the number of years worked, duration of shiftwork, and past medical and behavioral histories, including smoking, were obtained by self-administrated questionnaires. Linear regression analyses were performed, to show the relationships between shiftwork duration and metabolic risk factors, using simple and multivariate models, adjusted for age, smoking, job strain and physical activity. The following criteria were defined: hypertension as a SBP ≥ 160 or a DBP ≥ 90 mmHg at least once, hypercholesterolemia, as a serum total cholesterol ≥ 240 mg/dl, obesity as BMI (Body Mass Index) ≥ 25 kg/m² and central obesity as a WHR (Waist to Hip Ratio) ≥ 0.85 ; and the logistic regression analyses, according to years of shiftwork, were performed using simple and adjusted models.

Results: The cholesterol and fasting blood sugar showed increasing trends, but without statistical significances, according to the increase in shiftwork duration of the male workers, although, the increases in the blood pressure and BMI were statistically significant. In the nurses, only the WHR showed a significant increase in relation to the shiftwork duration. In the logistic regression analyses, hypercholesterolemia and obesity showed significant increasing risks according to the number of years of shiftwork (OR=3.32 95%CI 1.27-8.72 and OR=3.21 95%CI 1.24-8.32 respectively) in the male workers, but hypertension showed no significance. In the nurses, only an increased central obesity was significant as a risk factor (OR=1.30 95%CI 1.05-1.62).

Conclusions: These results provide evidence of the associations between shiftwork and metabolic risk factors for cardiovascular disease, although healthy shiftworker effects might exist in our cross sectional study design.

Key Words: Shiftwork, Blood sugar, Blood pressure, Obesity, Metabolic risk factor

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* 2000 (KRF-00-003-F00069).

1.

가
15~20%가
(Tenkane, 1997),
20%(Monk, 2000),
25% (, 1994).

1 226

(37)

1 134

8 ,

가 4 8

(Steenland

Fine, 1996). 8

가 (Knutsson, (3, 1))

1986), 가 1.5

2. , , ,

가 20%

(population attributable

risk) 7% (Akerstedt

Knutsson, 1997). 가 (TM2541, A & D

Company, Ltd, Japan).

가 가 3

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(,), ,

(가) 가 5

(WHO, 1998).

가

가 (Assmann 160 mmHg

, 1999; boggild Knutsson, 1999). 90 mmHg

가 (WHO, 1998).

240 mg/dl 125 mg/dl

가 BMI(Body mass index)가 25 kg/m²

(Waist to hip

ratio)가 0.85 (WHO,

1998).

3. : , 62.2 , 5.43 ~ 10) .
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 Karasek JCQ(Job Contents , 51.7%가 2 ,
 questionnaire) 25 (8), 1 16% , 70%
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 8 , 2
 78%가
 4. Karasek ,
 50.6%, 26.1%가
 , , , 20.0%, 29.2% .
 16 , 18 ,
 (Table 1).
 2.
 27% 2.2%가
 , 2.2%,
 3.1%가 , 24.6%,
 가 , 2.7%가 .
 , 6.6%
 (Table 2).
 3.
 SAS for windows(v8.0)
 가
 1. BMI WHR 가
 28.5(4.8 ,
 (Table 3).
 19~49) ,
 29.0(2.3 , 25~44) .
 95% 25~29 4. , ,
 20~24 가 21.3%, 25~29
 가 64.5% .
 44.2 (31.1 , 1 ~13.5) 1 가
 , 62.2(3

Table 1. Characteristics of study subjects

Variables		Male workers	Female nurses
Age (year)	Mean (Range)	29.1 (25~44)	28.5 (19~49)
Shiftwork duration	Mean (Range)	62.6 months (5.4 m~10 y)	44.2 months (1.0 m~13.5 y)
		No. (%)	
Marital status	Non-married	56 (41.8)	140 (62.0)
	Married	77 (57.5)	85 (37.6)
	Bereaved	1 (0.7)	1 (0.4)
Past Medical History	No	118 (88.1)	208 (92.0)
	Yes	16 (11.9)	18 (8.0)
Smoking	Non-smoker	18 (13.4)	224 (99.1)
	Ex-smoker	12 (9.0)	0
	Current smoker	104 (77.6)	0
	No response	0	2 (0.9)
Job Strain	Low strain	21 (15.6)	56 (24.8)
	Passive	68 (50.6)	59 (26.1)
	Active	18 (13.8)	45 (19.9)
	High strain	27 (20.0)	66 (29.2)

Table 2. Prevalences of metabolic risk factors among subjects

Characteristics	Male workers (n=134)		Female nurses (n=226)	
	No.	(%)	No.	(%)
Hypertension ^a	36	(26.9)	5	(2.2)
Hypercholesterolemia ^b	3	(2.2)	7	(3.1)
Hyperglycemia ^c	0	(0.0)	0	(0.0)
Obesity ^d	33	(24.6)	6	(2.7)
Central obesity ^e	-	-	15	(6.6)

a. Systolic BP \geq 160 mmHg or diastolic BP \geq 90 mmHg.

b. Total blood cholesterol \geq 240 mg/dl.

c. Fasting blood sugar \geq 125 mg/dl.

d. Body Mass Index \geq 25 kg/m².

e. Waist to Hip Ratio \geq 0.85.

(Table 4). (metabolic syndrome) (Assmann, 1999).

Table 3. Liner regression of shiftwork duration on metabolic risk factors of CVD^a

		Parameter	
		Male workers	Female nurses
Blood pressure (SBP/DBP)	Crude	3.4026*/4.6422*	0.0594/-0.2498
	Adjusted ^b	3.4598*/4.5661*	-0.0950/-0.3095
	Adjusted ^c	4.5156*/3.2119*	-0.0186/-0.3251
Cholesterol	Crude	3.1430	1.0868
	Adjusted ^b	3.3145	-0.0173
	Adjusted ^c	3.7098	0.0077
Fasting blood sugar	Crude	1.1307 [†]	0.0196
	Adjusted ^b	0.9295	-0.0950
	Adjusted ^c	1.3820	-0.0984
Body mass index	Crude	0.3382	0.0795
	Adjusted ^b	0.2945	0.0204
	Adjusted ^c	0.4525*	0.0202
Waist to hip ratio	Crude	-	0.0029*
	Adjusted ^b	-	0.0033*
	Adjusted ^c	-	0.0032*

a. The unit of shiftwork duration is year.

b. Adjusted for age.

c. Adjusted for age, smoking, physical activity and job strain.

* p<0.05, [†] p<0.1.

가 , 가
 (Neidhammer , 1996), 가
 가 (Boggild , 1999).
 가
 , 1 () 가
 가 3 (Nakamura , 1997).
 , 1.5 ~ 3 가 5 0.9 kg
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 1 가 BMI 1 0.07
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 가 1 0.098 kg/m²
 가 (Kawachi , 1995),
 가 (Biggild Knutsson, 1999), 0.12 kg/m² (Nakamura
 , 1997). , 가 가 1

Table 4. Risks of hypertension, hypercholesterolemia, obesity and central obesity associated with shiftwork duration

		Odds Ratio a (95% confidence interval)	
		Male workers	Female nurses
Hypertension ^d	Crude	1.27 (0.95~1.70)	0.91 (0.65~1.26)
	Adjusted ^b	1.25 (0.89~1.76)	0.83 (0.61~1.13)
	Adjusted ^c	1.09 (0.74~1.62)	0.83 (0.61~1.12)
Hypercholesterolemia ^e	Crude	2.42 (1.19~4.94)	0.94 (0.72~1.22)
	Adjusted ^b	3.32 (1.27~8.72)	0.86 (0.66~1.12)
	Adjusted ^c	3.92 (0.63~24.25)	0.88 (0.66~1.72)
Obesity ^f	Crude	1.54 (1.10~2.16)	1.11 (0.88~1.41)
	Adjusted ^b	1.45 (0.98~2.15)	1.06 (0.81~1.37)
	Adjusted ^c	3.21 (1.24~8.32)	1.07 (0.81~1.42)
Central obesity ^g	Crude	-	1.25 (1.07~1.46)
	Adjusted ^b	-	1.33 (1.06~1.66)
	Adjusted ^c	-	1.30 (1.05~1.62)

a. Increasing risk by the unit of shiftwork year.

b. Adjusted for age.

c. Adjusted for age, smoking, physical activity and job strain.

d. Systolic BP ≥ 160 mmHg or diastolic BP ≥ 90 mmHg.

e. Total blood cholesterol ≥ 240 mg/dl.

f. Body Mass Index ≥ 25 kg/m².

g. Waist to hip ratio ≥ 0.85 .

0.020() ~ 0.079() 가
) kg/m², 0.295()
) ~ 0.453() kg/m² , (Kawachi , 1995),
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 가 , 가 , 2001). ()
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