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Abstract

Effect Assessment of Worksite-based, Post-examination, Health Care Management System

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Objectives: This study was conducted to develop a worksite-based, post-examination, health care management system for continuous and systematic management of workers with hypertension, diabetes mellitus, hyperlipidemia, and abnormal LFT detected by periodic health examination and to assess the effectiveness such a system as an intervention study

Methods: Study subjects were selected from workers with hypertension, diabetes mellitus, hyperlipidemia, and abnormal LFT according to the selection criteria. The intervention group, but not the control group, received medical treatment of disease, follow up examination, and health education which consisted of information about the disease and the importance of life-style modification through periodic interview using the resources of occupational health service center in the worksite.

To assess the effectiveness of this system, we compared follow up examination data from the intervention group with periodic examination data from the worksite control group.

Results: In the intervention group a significant reduction trend was recorded for systolic and diastolic blood pressure, fasting blood sugar, postprandial 2 hour glucose, total cholesterol, triglyceride, LDL-cholesterol, AST, ALT, and γ -GTP, and a rising trend for HDL-cholesterol.

Significant group differences were recorded for fasting blood sugar, postprandial 2 hour glucose, total cholesterol, AST, and ALT.

Conclusions: The worksite-based, post-examination, health care management system was effective for the continuous and systematic management of workers who had abnormal findings detected by periodic health examination.

Key Words: Worksite-based, Post-examination, Health care management system, Intervention

가 (Zaret, 1992; Wood, 1998; Kessler, 2001; Goetzl, 2003).

2002 가 (D2) 4.85% 4.5% (, 2004; , 2004).

2003 2 36, 1 100 3 17, 1 47 4 12, 1 33 (, 2004).

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2002 760 2003 820 62% 59% 가 (, 2004).

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(Fig. 1).

(Table 1).

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Table 1. Selection criteria for study subjects

Disease categories	Variables	Values		Unit
		Intervention	Control [†]	
Hypertension	Systolic blood pressure	160	159	mmHg
	Diastolic blood pressure	100	95	
Diabetes mellitus	Fasting blood sugar	140	121	mg/dL
	Postprandial 2 hour glucose	200		
	Urine glucose		+1	
Hyperlipidemia	Total cholesterol	310	161	mg/dL
	Triglyceride	400		
	LDL cholesterol	210		
Abnormal LFT	AST HBV, HCV*	90	51	U/L
	-		51	
	ALT HBV, HCV*	80	46	
	-	200	46	
	-GTP HBV, HCV*	130	78	
-	300	79		

* Subjects who have hepatitis B or C virus; † Subject who was not belongs to intervention group.

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(Body mass index; BMI) 2002

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2, HDL-
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, AST (aspartate aminotransferase),
ALT(alanine aminotransferase), -GTP (-glu-
tamyl transpeptidase)

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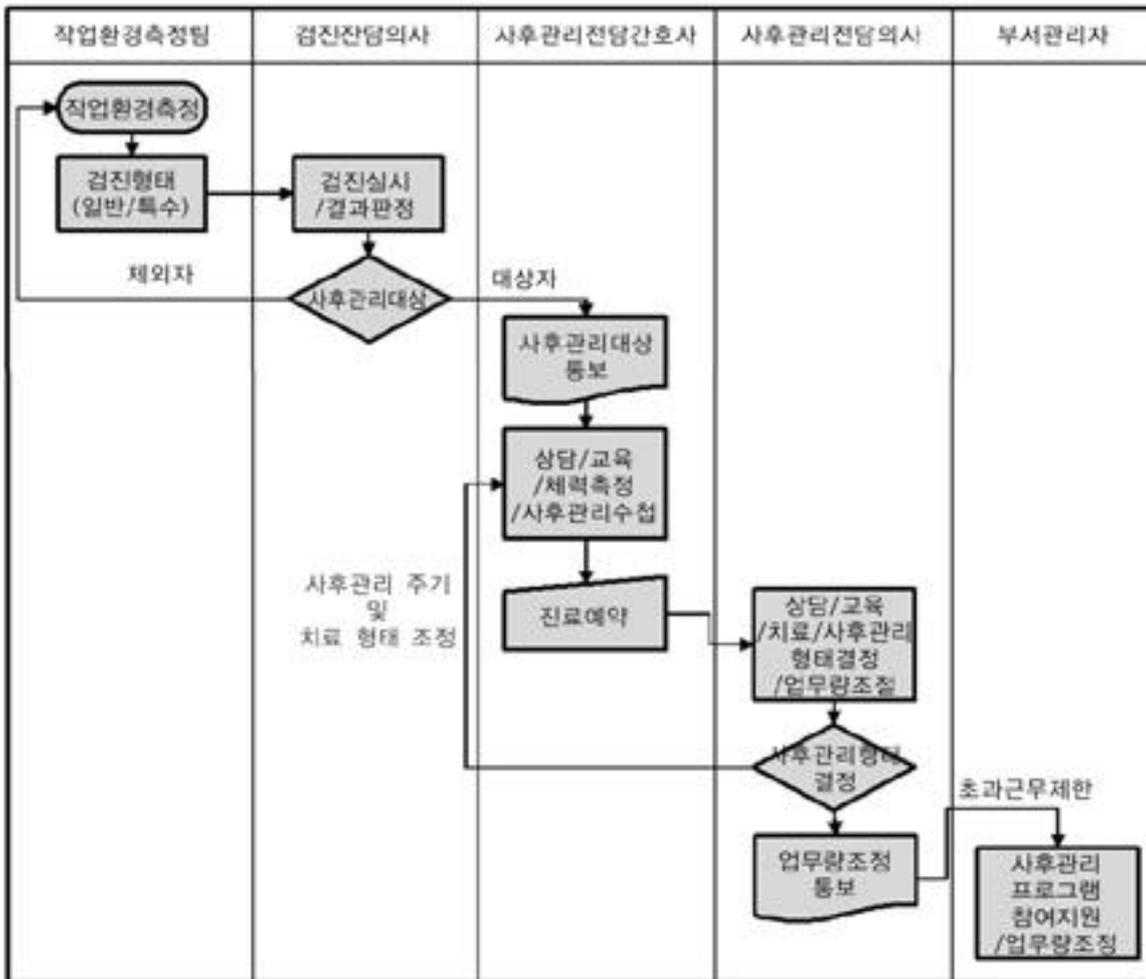


Fig. 1. Post-examination health care system flowchart.

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 4,281 17.3%

Table 2. Number of observed data from intervention group at each time of analysis

Disease categories	Variables	Number of observed data				Total [†]	Analysis [‡]
		Baseline	6 month	12 month	18 month		
Hypertension	Systolic blood pressure	480	244	219	210	490	219
	Diastolic blood pressure	482	246	218	211		
Diabetes mellitus	Fasting blood sugar	395	103	60	63	434	161
	Postprandial 2 hour glucose	414	215	126	151		
Hyperlipidemia	Total cholesterol	613	254	188	179	617	195
	Triglyceride	603	181	81	114		
	HDL cholesterol	606	225	126	114		
	LDL cholesterol	596	189	148	111		
Abnormal LFT	AST	398	131	155	99	412	161
	ALT	398	132	154	99		
	-GTP	397	134	156	92		

[†] Total number of intervention group; [‡] The number of subjects who were included in this analysis

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2. 43.1 40.1 45.0 가 6 가 12 18 41.3 가 2 3,860 40.3 AST ALT 12 가 680 가 670 -GTP 6 12 18 98.5% 1.5% 3,860 (Fig. 2). 가 99.7% 가 repeated measure ANOVA 가 (p<0.01)(Table 3). 가 18 가 6 12 3. 가 345 1) 130 가 6 12 (p<0.05) 6 12 가 18 2 6

Table 3. Distribution of age and employ duration in study subjects categorized by disease

Disease categories		Number*	Age		p-value [†]	Sex		p-value [‡]
			Mean	SD		M	F	
Hypertension	Intervention group	219	45.0	5.4	< 0.01	214	5	0.41
	Control group	229	41.7	5.5		227	2	
Diabetes mellitus	Intervention group	161	43.5	5.2	0.28	161	1	0.87
	Control group	200	42.8	5.6		199	1	
Hyperlipidemia	Intervention group	195	41.3	5.6	< 0.05	190	5	< 0.01
	Control group	2,003	40.4	5.0		1996	7	
Abnormal LFT	Intervention group	161	42.0	5.3	< 0.01	161	0	0.51
	Control group	3,633	40.1	5.0		3625	8	
Total	Intervention group	680	43.1	5.5	< 0.01	670	10	< 0.01
	Control group	3,860	40.3	5.1		3849	11	

* Number of each category is overlapped; [†] Results of independent t-test; [‡] Results of chi-squar teat; SD, Standard deviation; LFT, Liver function test.

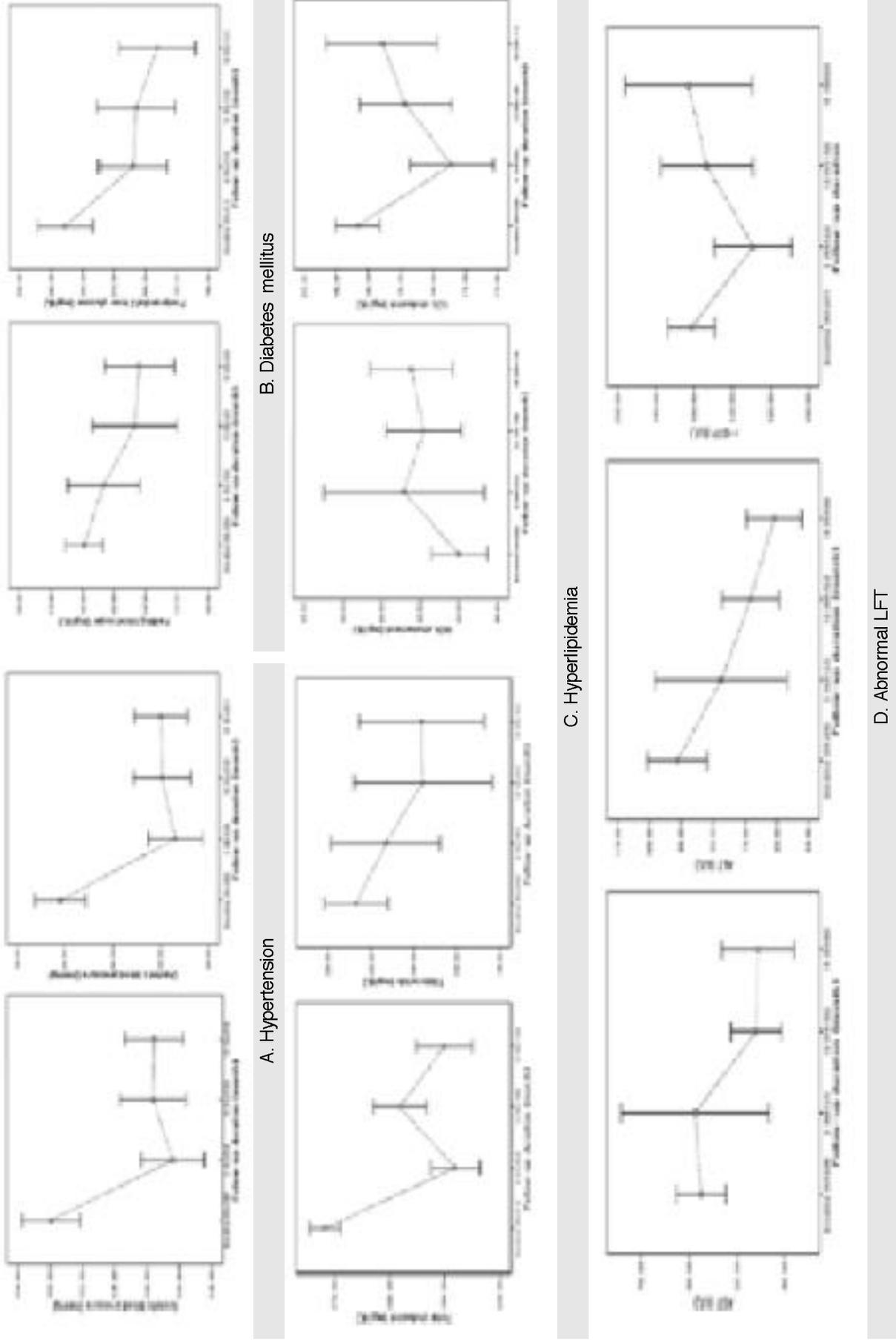


Fig. 2. Error bar charts of all measured variables of the intervention group.

12

LDL- 가 4.
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 (p<0.05) 12
 6 가 ANCOVA Table 5
 HDL- 가
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 (p<0.05)(Table 4). 148.9 mmHg
 145.7 mmHg 3.2 mmHg
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 2002 8 159.6 mg/dL 143.3 mg/dL 16.3
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 2 2004 6 1 mg/dL 3.3 mg/dL 2
 2003 2004 238.4 mg/dL 202.9 mg/dL
 35.5 mg/dL 158.7

Table 4. ANOVA with repeated measure within intervention group

Disease categories	Variables	Number*	Baseline		6 month		12 month	
			Mean	SD	Mean	SD	Mean	SD
Hypertension (mmHg)	Systolic blood pressure	130	151.9	16.5	142.8 ^a	14.2	141.8 ^a	14.1
	Diastolic blood pressure	130	95.5	10.3	90.7 ^a	8.7	89.2 ^a	8.1
Diabetes mellitus (mg/dL)	Fasting blood sugar	13	152.0	46.5	130.6	32.4	125.7	18.6
	Postprandial 2 hour glucose	71	227.7	91.0	201.2	73.6	200.2	61.5
Hyperlipidemia (mg/dL)	Total cholesterol	58	279.3	33.0	249.8 ^a	41.1	253.1 ^a	37.3
	Triglyceride	30	311.7	231.8	212.0 ^a	138.5	241.0	129.6
	HDL cholesterol	55	49.6	12.7	51.5	10.3	51.4	9.5
	LDL cholesterol	74	205.1	41.6	176.3 ^a	45.1	184.6 ^a	44.4
Abnormal LFT (U/L)	AST	41	86.6	70.5	80.0	144.7	51.1 ^a	49.8
	ALT	41	154.2	150.4	108.8	203.1	65.9 ^a	52.6
	-GTP	43	183.3	129.3	134.3 ^a	141.2	141.0 ^a	146.9

* Number of each category is overlapped; SD, Standard deviation; a Significant difference from baseline values (p < 0.05).

mg/dL 164.3 mg/dL 5.6 mg/dL (p<0.01). -GTP
 2 165.5 U/L 153.2 U/L 12.3 U/L
 (p<0.01). 76.7 U/L 71.8 U/L 4.9
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 LDL- 12
 267.7 mg/dL 258.1 mg/dL 9.6 mg/dL
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 36.7 U/L 29.1 U/L 7.6 U/L 가
 (p<0.023).
 (p<0.01). ALT 94.3 U/L
 68.4 U/L 25.9 U/L 54.7
 U/L 41.9 U/L 12.8 U/L (p<0.05).

Table 5. Comparison of change of clinical variables between intervention group and control group

Disease categories	Variables	Group	Number*	Baseline		12 month		p-value [†]	
				Mean	SD	Mean	SD		
Hypertension (mmHg)	Systolic blood pressure	Intervention	219	148.9	17.3	145.7	15.1	0.928	
		Control	229	146.4	12.4	142.8	15.1		
	Diastolic blood pressure	Intervention	218	94.4	10.3	91.9	8.8		0.707
		Control	229	91.9	6.4	89.8	10.7		
Diabetes mellitus (mg/dL)	Fasting blood sugar	Intervention	60	159.6	52.9	143.3	52.0	0.001	
		Control	200	111.6	20.9	114.9	17.2		
	Postprandial 2 hour glucose	Intervention	126	238.4	94.4	202.9	68.9		< 0.001
		Control	103	158.7	35.4	164.3	49.1		
Hyperlipidemia (mg/dL)	Total cholesterol	Intervention	188	267.7	32.4	258.1	33.3	0.002	
		Control	2,003	231.3	13.8	218.2	22.2		
Abnormal LFT (U/L)	AST	Intervention	155	59.2	59.0	46.0	32.9	0.002	
		Control	3,633	36.7	22.1	29.1	10.6		
	ALT	Intervention	154	94.3	111.8	68.4	55.1	0.005	
		Control	3,633	54.7	30.9	41.9	22.1		
	-GTP	Intervention	156	165.5	121.4	153.2	150.8	0.001	
		Control	3,633	76.7	48.3	71.8	71.8		

*Number of each category is overlapped; SD, Standard deviation; [†] Results from ANCOVA adjusted for age, sex, BMI, smoking, exercise, alcohol consumption, and job characteristics.

AST , 327 52.8% ,
 가(p<0.05), ALT , 618 2002 309 50.0% 2003
 307 49.7% .
 (p<0.01). -GTP 618 3
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 2002 2003 3,852 2002
 , , , 2,284 59.3% 2003 2,278
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 2002 339 54.8% 2003 3,855 2002 2,120 55.0% 2003

Table 6. Results of multiple regression analysis with change of measured values as independent variable

Dependent variable	Independent variables			Model summary			
		Regression coefficient	Standard error	p-value	F	p-value	Model R ²
Hypertension							
Systolic blood pressure	Smoking	3.534	1.949	0.071	0.673	0.716	0.012
Diastolic blood pressure							
Smoking	2.900	1.277	0.024	0.830	0.576	0.015	
Diabetes mellitus							
Fasting blood sugar	Intervention	-18.934	5.778	0.001	2.114	0.035	0.063
Postprandial 2 hour glucose	Intervention	-45.315	11.154	< 0.001	3.796	< 0.001	0.124
	Smoking	26.276	11.498	0.023			
Hyperlipidemia							
Total cholesterol	Intervention	3.398	1.813	0.061	5.494	< 0.001	0.020
	Sex	18.551	6.893	0.007			
	Exercise	-4.263	1.135	< 0.001			
	BMI	2.006	0.602	0.001			
Abnormal LFT							
AST	Intervention	-5.339	2.083	0.010	4.836	< 0.001	0.010
	Exercise	-1.851	0.913	0.043			
	Smoking	1.826	0.848	0.031			
	BMI	1.882	0.473	< 0.001			
ALT	Intervention	-13.728	3.124	< 0.001	15.633	< 0.001	0.032
	Exercise	-3.677	1.365	< 0.001			
	Smoking	3.429	1.269	0.007			
	Alcohol	4.624	1.241	< 0.001			
	BMI	5.543	0.708	< 0.001			
-GTP	Intervention	-6.923	3.797	0.068	4.030	< 0.001	0.022
	Exercise	-6.017	1.670	< 0.001			
	BMI	6.553	0.865	< 0.001			

Independent variable : Intervention, age, BMI, sex, exercise, smoking, alcohol consumption, and Job characteristics.

2,100 54.5%
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2002 797 20.7% 2003
1,140 29.6% 가

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(p<0.01).

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(Kornitzer ,
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1977; Friedman , 1981; Jacobs Rottenborg,
1981; Yuan , 1996).

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6.7% 9.6%

Johnson & Johnson

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The JNC 7 report

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120~130 mmHg 80~89 mmHg

, 140~159 mmHg 90~99 mmHg 1

41

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(Kawachi, 1995;

Neidhammer, 1996; Steenland, 1996;

Nakamura, 1997; Assmann, 1999; Boggild,

1999. Akerstedt

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(Karasek, 1979; Karasek, 1996;

Siegrist, 1996; Won, 2003).

1999 WHO

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(The Expert Committee on the Diagnosis and Classification of Diabetes Mellitus, 2003; WHO, 1999; The Expert Committee on the Diagnosis and Classification of Diabetes Mellitus, 1997; WHO, 1985; National Diabetes Data Group, 1979).

110 mg/dL

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160 mmHg

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121 mg/dL

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AST 51 U/L ALT 46

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U/L

-GTP

78 U/L

46 U/L

(

, 2004)

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- 285-308.
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