[Environmental Health and Preventive Medicine 5, 66-71, July, 2000]

Original Article

Influence of Life-related Factors and Participation in Health Examination on Mortality in a 4.5-year Follow-up of a Rural Cohort

Shankuan ZHU*1, Takaaki KONDO*1, Hisataka SAKAKIBARA*2, Koji TAMAKOSHI*1, Kunio MIYANISHI*3, Nao SEKI*3, Naohito TANABE*3 and Hideaki TOYOSHIMA*1

*1 *Department of Public Health, Nagoya University School of Medicine, Nagoya*
*2 *Division of Public Health and Home Nursing, Department of Nursing, Nagoya University School of Health Science, Nagoya*
*3 *Department of Public Health, Niigata University School of Medicine, Niigata*

Abstract

To identify life-related factors causing increased mortality, 2,769 rural residents aged 29-77 were investigated through a self-administered questionnaire in 1990. Death certificates and migration information were inspected during the 4.5-year follow-up period. Age, obesity, life attitude, job, marital status, drinking and smoking habits, previous or current illness, and frequency of participation in health examinations were checked during the baseline survey. The person-year mortality rate was higher among irregular participants in health examinations than among regular participants both among males and females. From Cox's multiple regression analysis, factors with a significantly high hazard ratio (HR) for mortality were irregular participation (HR=2.05), increase of age (HR=1.54, for 10 years), previous or current illness (HR=2.44), unemployment (HR=1.95), and living without a spouse (HR=2.61) for males; and for females they were having previous or current illness (HR=15.21) and living without a spouse (HR=2.94). Thus, irregular participation in health examinations, unemployment and aging showed a relationship with a higher mortality only in males. A previous or current illness and living without a spouse were related in both sexes.

Key words: life-related factors, health examination, all-cause mortality, cohort study, hazard ratio

Introduction

As chronic diseases such as cancer, circulatory diseases and diabetes have been increasing in Japan in recent years, primary as well as secondary preventive measures have now become more and more important in achieving eventual control of these diseases [1-3]. Detection of life-related risk factors for mortality as well as participation in health examinations seem to be effective approaches to both primary and secondary prevention of diseases, i.e., identification of the causes, prevention of onset of diseases, and early detection and treatment [1, 4, 5]. Many studies on the relationships of mortality with some life-related factors such as drinking habits, marital status, job and life attitude, have been conducted [6-12]. However, these relationships are not completely understood to date. On the other hand, though the effects of screening for some cancers on reducing cancer-caused mortality have been reported, studies on the comprehensive effect of health examinations or screenings of all causes of mortality are still few in number [1,5]. Moreover, the conclusions from a number of studies on cause-specific mortality rates are somewhat vague. Some researchers have speculated that participating in health examinations and follow-up educational programs could result in a positive change in awareness of the risk factors and reduction of these factors [4]. Others have indicated that mortality in nonparticipants was high due to the prevalence of cigarette smoking, heavy consumption of alcohol, illness, or physical weakness [13-15].

In our study area, general health examinations and periodic screenings were available annually to all residents aged 40 or over, conducted by the local government under the Health Law for the Elderly, Japan. Though people underwent these examinations or screenings on a voluntary basis, only a few had not received a health examination or screening for up to five years. The present cohort study attempted to determine whether there is a relationship between the frequency of participating in health examinations or screenings and mortality. The relationships of

Received Nov. 15 1999/Accepted Feb. 17 2000
Reprint requests to: Hideaki TOYOSHIMA,
Department of Public Health, Nagoya University School of Medicine, 65 Tsurumai-cho, Showa-ku, Nagoya 466-8550, Japan
TEL: +81(52)744-2128 FAX: +81(52)744-2131
E- mail: toyosima@med.nagoya-u.ac.jp

some life-related factors such as previous or current illness, life attitude, job, marital status, cigarette smoking, and alcohol consumption with mortality were also analyzed.

Materials and Methods

As part of a nation-wide collaborative large-scale cohort study on the evaluation of risk factors for cancer sponsored by a Grant-in-Aid for Scientific Research on Priority from the Ministry of Education, Science, Sports and Culture of Japan (detailed information provided elsewhere[16]), 2,925 rural residents aged 40-75 years in S village in northwestern Japan were asked to fill out a self-administered questionnaire in July and August, 1990. A total of 2,615 people responded. Meanwhile, the same survey was conducted among subjects outside that age range, and questionnaires from 153 subjects aged 29-39 and one subject aged 77 living in the same area were thus obtained. Therefore, in the present study, the total subjects numbered 2,769, ranging in age from 29 to 77 years old (1,290 males and 1,479 females). The follow-up study consisted of a yearly inspection of death certificates and migration reports, which provided individual names, age, sex, and birth dates with official permission from the Ministry of General Affairs and local governments. In this paper, the follow-up data obtained by December 31, 1994, was used. During the 4.5-year follow-up, 106 subjects died (72 males and 34 females), and 18 subjects moved away (9 males and 9 females).

The questionnaire used in the baseline survey covered many aspects relevant to health, living and working conditions, lifestyles, eating habits, daily activities and so on. In the present study, the following 9 items were selected for analyses: 1, age; 2, obesity; 3, life attitude; 4, job status; 5, marital status; 6, drinking habits; 7, smoking habits; 8, previous or current illness; and 9, history of participation in general health examinations and periodic health screenings. Definitions of items 2 to 7 are summarized in Table 1.

Subjects with a previous or current illness were taken to mean those currently receiving treatment and/or who have had one of the following diseases: stroke, hypertension, myocardial infarction, kidney diseases, liver diseases, cholelithiasis or cholecystitis, diabetes mellitus, stomach or duodenal ulcer, tuberculosis, or cancer.

Subjects who participated in at least one of the following health programs were considered to be undergoing health examination or screening: 1, general health examination including screening for circulatory diseases; 2, screening for tuberculosis and lung cancer; 3, screening for stomach cancer; 4, screening for uterine cancer; 5, screening for breast cancer.

On the basis of the response to the question about the number of times of participating in a health examination and/or screening during the past five years, subjects could be divided into three categories: 1, those who had participated five times or more: Regular participants (RPs); 2, those who had participated less than five times: Irregular participants (IPs); and 3, those who failed to respond: Non-respondents (NRs).

The question about the number of times a respondent had undergone a health program was indicated as 'optional'. This caused an extraordinarily high non-responding rate (26.7% for males and 15.2% for females), whereas only 1.8% of males and 2.0% of females, on average, did not respond to other questions that were not 'optional' (data not presented).

Table 1 Definitions of factors investigated in the baseline survey

Factors	Yes	No
Obesity	BMI*>=25 kg/m^2	BMI*<25 kg/m^2
Positive attitude to life	Life is very worth or worth living	Life is mediocre or not worth living
Job	Employed permanently, self-employed, or other	Part-time job, housewife, or jobless
Marital status	Living with spouse	Widowed, divorced or unmarried
Drinking habit	Have or quit	Never
Smoking habit	Have or quit	Never

*: BMI: Body Mass Index

Individual person-year was calculated by dividing the total number of survival days from the day of the baseline survey by 365.25. Persons lost to follow-up because of moving away were considered censored. The mean ages of IPs and NRs were compared with RPs by Student's t test. The percentages of subjects with affirmative answers for lifestyle questions in IPs and NRs were compared with RPs, controlling for age by the Mantel-Haenszel test. Person-year mortality rates in RPs, IPs and NRs, and between subjects with and without additional factors, were statistically compared by Z test. To estimate the effects of the factors on mortality by adjusting those of covariates, hazard ratios were calculated using the Cox's proportional hazards model. Differences were considered significant at $p<0.05$, after p was adjusted by Bonferroni correction. Analyses were conducted using the statistical software SAS (Statistical Analysis System, Version 6, SAS Institute, Cary, NC, USA). Subjects were analyzed separately by sex throughout the study.

Results

Table 2 shows the characteristics of three categories of participants, i.e., RPs, IPs and NRs. Among males, the average age was 54.8 years in RPs, 52.4 in IPs, and 55.5 in NRs, indicating a significant difference between RPs and IPs. In females, the average age was 54.1 years in RPs, 56.0 in IPs, and 59.7 in NRs, showing a significant difference between RPs and IPs, and between RPs and NRs. The person-year mortality rate in males was 17.4 per 1000 person-years for IPs and 18.6 for NRs, both of which were significantly higher than that of RPs (8.6 per 1000 person-years). In females, the mortality rate was 8.7 per 1000 person-years in IPs, 6.1 in NRs and 3.8 in RPs. A significant difference could only be observed between RPs and IPs.

Application of the Mantel-Haenszel method for age adjustment showed in males a significantly higher percentage of job and living with spouse among RPs than among IPs. Among females, RPs showed a significantly increased percentage in previous or current illness and job than IPs, whereas the percentage of obesity among IPs was greater than among RPs. When a comparison was made for males between RPs and NRs, there was a significantly higher percentage detected for previous or current illness, positive attitude toward life, and living with spouse among RPs. For females, percentages of previous or current illness and positive attitude toward life were significantly smaller in NRs than in RPs, whereas the percentage of smoking habits was higher in NRs than in RPs.

Table 3 shows person-year mortality rates in different age

groups and in all subjects, and the mean and range of the age of the deceased and all subjects at baseline. Among males, the mortality was lowest in the below-45 age group with person-year mortality of 2.3 per 1000 person years and reached highest rate at 28.9 in the 65-or-over age group. The mortality increased along with the age increasing. A similar tendency could also be observed among females. The average age of the deceased and all subjects was 61.9 and 54.5 for males, respectively, and 63.4 and 56.1 years for females, respectively.

Table 4 shows a comparison of person-year mortality rates between those subjects with each lifestyle factor and those without it. The mortality rate was significantly higher among subjects with a previous or current illness than subjects without one, both in males and in females. Subjects who had a positive life attitude or a job, or who lived with a spouse, had a significantly lower mortality rate than those who did not in both sexes. There was no significant difference in mortality rates with or without obesity, drinking or smoking habits. Hence, obesity, smoking and drinking habits were not used as independent variables in Cox's proportional hazard model as shown in Table 5.

Table 5 shows hazard ratios for mortality with respect to various factors. The hazard ratio between IPs and RPs was statistically significant in males (RR=2.05, $p<0.05$), but not in females (RR=1.63, $p>0.1$). For hazard ratios between NRs and RPs, no significant difference was detected in either sex. For subjects with advanced age, a previous or current illness, no job or living without a spouse, there was a significantly higher hazard ratio among males. Among females, only those having a previous or current illness and living without a spouse showed a significantly higher risk of mortality.

Discussion

The present study indicated that male subjects who participated in health examinations or screenings for 5 consecutive years had a lower all-cause mortality than those who did so irregularly. This finding was partly in accordance with previous studies, even though their subjects were divided into participants and nonparticipants based on only one health

Table 2 Characteristics of regular participants (RPs), irregular participants (IPs), and non-respondents (NRs) in males and females

	Males (n=1290)			Females (n=1479)		
	RPs	IPs	NRs	RPs	IPs	NRs
Age, yr (Mean ± SD)	54.8 ± 9.7	52.4 ± 9.8**	55.5 ± 10.4	54.1 ± 11.7	56.0 ± 9.6*	59.7 ± 9.5**
Mortality rate (1/1000 person-year)	8.6 (25/672)	17.4# (20/274)	18.6## (27/344)	3.8 (15/906)	8.7# (13/348)	6.1 (6/225)
Obesity, %	13.6 (91/667)	13.7 (37/271)	14.5 (49/337)	21.7 (195/897)	27.8++ (92/342)	21.9 (48/219)
Previous or current illness, %	64.0 (424/663)	59.3 (159/268)	56.3++ (191/339)	57.4 (511/890)	47.1++ (160/340)	53.9++ (117/217)
Positive attitude to life, %	49.5 (331/669)	44.6 (120/269)	35.3+++ (119/337)	33.9 (303/895)	30.6 (106/346)	24.1++ (53/220)
Job, %	61.3 (400/653)	54.5+++ (146/268)	55.1 (183/332)	37.2 (327/880)	34.6++ (117/338)	23.9 (51/231)
Living with spouse, %	94.5 (618/654)	87.9+++ (233/265)	88.5+++ (285/322)	86.2 (734/852)	83.2 (272/327)	81.7 (170/208)
Drinking habit, %	88.3 (588/666)	93.4+ (253/271)	88.6 (302/341)	21.1 (192/892)	27.4 (93/339)	20.2 (45/223)
Smoking habit, %	80.8 (538/666)	82.6 (223/270)	81.1 (275/339)	1.8 (16/874)	3.9 (13/333)	4.7+++ (10/214)

Numerator and denominator in respective parentheses represent the number of subjects who responded in the affirmative (number of deaths for mortality rate), and the number of subjects who responded (number of total subjects for mortality rate).

*: $p<0.05$; **: $p<0.01$, statistical comparison with RPs, by Student's t test, p was adjusted by Bonferroni correction (p/c, c=2).

#: $p<0.05$; ##: $p<0.01$, statistical comparison with RPs, by Z test, p was adjusted by Bonferroni correction (p/c, c=2).

+: $p<0.1$; ++: $p<0.05$; +++: $p<0.01$, statistical comparison with RPs controlling for age (age was divided into four groups, below 45, 45-54, 55-64, and 65 or over years), by Mantel-Haenszel test, p was adjusted by Bonferroni correction (p/c, c=2).

Table 3 Person-year mortality rates (1/1000 person-year) in different age groups, and mean and range of age for the deceased and all subjects, and for males and females

	Males			Females		
Age (yr)	n	number of deaths	mortality rate	n	number of deaths	mortality rate
− 44	301	3	2.3	265	2	1.7
45 − 54	332	11	7.7	345	2	1.3
55 − 64	389	26	15.7	490	11	5.2
65 −	268	32	28.9	379	19	11.6
	n	Mean (SD)	Range	n	Mean (SD)	Range
Deceased	72	61.9 (8.2)	42 − 74	34	63.4 (8.1)	37 − 74
All	1290	54.5 (10.3)	29 − 74	1479	56.1 (10.3)	34 − 77

examination or screening[5, 13].

In some work-site health surveys, significantly higher mortality rates from many causes, particularly from smoking and alcohol abuse-related diseases, were found among nonparticipants in health examinations or screenings[13, 14]. The authors speculated that the reason was most likely that the percentages of cigarette smokers and heavy alcohol consumers were smaller among the participants than among the nonparticipants. Similarly, Tilley et al found that workers who did not participate in a colorectal cancer screening program experienced significantly higher mortality than workers who did[15]. However, they speculated that the lower mortality rate among participants was due to a 'healthy worker effect', and that workers with some symptoms would seek attention from their personal physicians rather than participating in health examinations.

In the present study, no significant difference in the percentages of smokers or drinkers was detected between RPs and IPs in either sex. In addition, smokers, drinkers or the obese failed to show a significantly higher mortality rate than non-smokers, non-drinkers or non-obese. Therefore, cigarette smoking, alcohol consumption and obesity did not cause a higher mortality rate in IPs in the present study.

Although the effects of alcohol consumption on health were rather complicated, many studies have shown that light to moderate alcohol consumption has a protective effect against some threats to mortality, especially from coronary heart disease[6-10, 12]. In the present study, however, the quantity of alcohol consumption was not counted. This may explain why the mortality rate among the drinkers was not significantly higher than among non-drinkers. The same reasoning would be applicable for the failure of detecting an association between obesity and mortality, since some researchers also observed a J-phenomenon that both high and low levels of BMI were associated with a higher mortality rate from all causes than middle level of it[17, 18]. The reasons for not being able to find a significantly higher mortality rate among smokers than among non-smokers in the present study might be the short follow-up period among males and the few smokers among females.

On the other hand, subjects with a previous or current illness had a significantly increased person-year mortality rate than those without one. Moreover, the proportion of subjects with a previous or current illness was higher among RPs than among IPs, though the difference was not significant in males. In the present study, though we could not identify those diseases detected by health examinations or screenings, undergoing health examinations or screenings might appear to increase the chance of detecting diseases at an early stage. In addition, developing some kinds of diseases might lead subjects to pay more attention to their health status and thus lead to a higher proportion of subjects with a previous or current illness among RPs.

IPs, however, might include more subjects with severe or incurable diseases, because such persons are generally too ill to travel to a health examination or screening site, or are more likely to seek attention from their own physicians[13, 15]. This suggests the

Table 4 Comparison of person-year mortality rates (1/1000 person-year) between subjects with and without factors in males and females

	Male (n=1290)				Female (n=1479)			
Factors	Without factors		With factors		Without factors		With factors	
Obesity	12.1	(57/1098)	10.6	(8/ 117)	4.1	(20/1120)	6.8	(10/ 338)
Previous or current illness	5.1	(11/ 469)	17.7**	(58/ 774)	0.7	(2/ 659)	8.5**	(29/ 788)
Positive attitude to life	15.3	(46/ 705)	8.6*	(21/ 570)	6.2	(27/ 999)	2.0*	(4/ 462)
Job	19.0	(42/ 524)	6.0**	(19/ 729)	6.6	(27/ 936)	1.8*	(4/ 495)
Living with spouse	25.1	(11/ 105)	9.4**	(46/1136)	12.2	(11/ 211)	2.9**	(15/1176)
Drinking habit	12.2	(7/ 135)	13.1	(64/1143)	5.1	(25/1124)	2.1	(3/ 330)
Smoking habit	9.7	(10/ 239)	12.9	(57/1036)	4.5	(27/1382)	5.9	(1/ 39)

Numerator and denominator in parentheses represent the number of subjects who died during follow-up period, and total number of subjects who responded to respective items.

*: $p<0.05$; **: $p<0.01$, statistical comparison of person-year mortality rates between subjects with and without factors, by Z test.

Table 5 Hazard ratios for mortality by Cox's proportional hazards model in males and females §1

	Male §2		Female §2	
Variables	Hazard ratio	95% CI	Hazard ratio	95% CI
IPs(1)/RPs(0) §3	2.05*	1.01-4.15	1.63	0.68-3.90
NRs(1)/RPs(0) §3	0.60	0.31-1.16	0.86	0.28-2.64
Age §4	1.54**	1.12-2.12	1.07	0.64-1.78
Previous or current illness Yes (1)/No (0)	2.44*	1.12-5.35	15.21**	2.01-115.24
Positive attitude to life No (1)/Yes (0)	1.75+	0.95-3.22	2.18	0.75-6.35
Job No (1)/Yes (0)	1.95*	1.01-3.77	3.61+	0.78-16.36
Living with spouse No (1)/Yes (0)	2.61**	1.26-5.41	2.94**	1.32-6.57

§ 1: Death (1), Survival (0).

§ 2: 1139 males survived, 49 males died, 102 males with no response;
1283 females survived, 26 females died, 170 females with no response.

§ 3: IPs, irregular participants; RPs, regular participants;
NRs, non-respondents to the questions about health examination or screening.

§ 4: Age was divided into four groups: below 45, 45-54, 55-64, and 65 or over.

+: $p<0.1$; *: $p<0.05$; **: $p<0.01$.

strong possibility that higher mortality in IPs was due to a bias related to the higher proportion of more severely ill patients in the IPs. This hypothesis is particularly important, given that our mortality data were obtained during the initial 4.5 years of the follow-up period. Some of the deceased probably had already developed a disease before the baseline survey was conducted.

The present study showed a higher proportion of subjects who had a job or lived with a spouse in RPs than in IPs, and a lower person-year mortality among subjects who had a job or a positive life attitude, or lived with a spouse than subjects who did not. Though the hazard ratios of a positive life attitude among the male group and a job in females only showed a borderline difference in Cox's regression model analysis, the hazard ratio of a job in males and living with a spouse in both sexes still remained significant. This indicated that living with a spouse would reduce the risk for mortality.

Kaprio et al, in their historical cohort study, found significantly high hazard ratios for all causes of death as well as for cardiovascular disease among males who had never married compared to males who had, and that most of this excess risk was due to psychiatric disorders [11]. They also reported that men who never married had the shortest occupationally active life expectancy, whereas married men had the longest. These findings were in partial agreement with ours. From the present study, it could not be determined whether being single or divorced, or becoming a widower/widow, increased mental disorder morbidity or decreased the opportunity to find jobs, or vice versa. However, differences in mortality between those of different marital status might persist throughout nearly an entire life span [11, 12].

In Cox's regression model analysis, age showed a very strong relationship with mortality in males but not in females. The average age for female subjects was 56.1 years old, and that for female deceased was 63.4 years old, which were far below the average life expectancy among females and thus caused fewer deaths. This might also be one reason for the failure to detect a lower mortality rate for females among RPs.

The limitations of the present study were the small sample size of the study population and the short follow-up period. Thus, the cause-specific mortality could not be computed separately. In addition, the items in the questionnaire about participating in health examination or screening were in the 'option section', which might have caused an extraordinarily high non-response rate. Obviously, we could not elucidate the characteristics of this type of non-respondent. However, the non-respondents to the items in 'option section' in the present study were considered to consist of non-respondents to items which were not indicated to be optional (about 1.8-2.0% of subjects in the present study), irregular participants, and regular participants. Table 2 indicated NRs were most likely to have characteristics more similar to IPs than to RPs in both sexes, though the hazard ratios for mortality was not significantly higher for NRs than for RPs in either sex.

Despite these limitations, the present study demonstrated a relationship between regular participation in health examinations or screenings and lower all-cause mortality in males, for reasons that remain unclear. Age and employment also contributed to the higher mortality rate only in males. However, previous or current illness and marital status played a crucial role in causing higher mortality in both males and females. Further study is required with a longer follow-up period to confirm these findings and elucidate the reason for the male versus female differences.

Acknowledgments

This study is part of the nation-wide collaborative cohort study of cancer supported by a Grant-in-Aid for Scientific Research on Priority from the Ministry of Education, Science, Sports and Culture of Japan from 1990 through 1998 (No. 06279102; Chairman: Yoshiyuki Ohno, Professor of Nagoya University, Former Chairman: Kunio Aoki, Emeritus Professor of Nagoya University). We are grateful to the government officials and people of S Village, Niigata Prefecture, Japan, as well as to Dr. Senji Hayashi for their generous cooperation in the course of this study.

References

1) Miller AB. Epidemiological approaches to primary and secondary prevention of cancer. J Cancer Res Clin Oncol 1991; 117: 177-85.
2) Farquhar JW, Fortmann SP, Flora JA, et al. Effects of communitywide education on cardiovascular disease risk factors-The Stanford Five-City Project. JAMA 1990; 264(3): 359-65.
3) Stamler J, Vaccaro O, Neaton JD, Wentworth D. Diabetes, other risk factors, and 12-yr cardiovascular mortality for men screened in the multiple risk factor intervention trial. Diabetes Care 1993; 16(2): 434-44.
4) Terao A, Konishi M, Baba S, Mannami T. Effects of health examination and follow-up educational programs on awareness and modification of risk factors for cardiovascular disease in a Japanese urban population (in Japanese with English abstract). Jpn J Pub Health 1997; 44(6): 440-9.
5) Shirasaki S. The relationship between health examination and mortality according to health laws for elderly-Are high cholesterol and obesity not good? (in Japanese) Nihon Ijishinpo 1997; 3831: 41-8.
6) Suh I, Shaten J, Cutler JA, Cutler JA, Kuller LH. Alcohol use and mortality from coronary heart disease: The role of high-density lipoprotein cholesterol. Ann Intern Med 1992; 116(11): 881-7.
7) Shaper AG, Wannamethee G, Walker M. Alcohol and mortality in British men: explaining the U-shaped curve. Lancet 1988; 2: 1267-73.
8) Friedman LA, Kimball AW. Coronary heart disease mortality and alcohol consumption in Framingham. Am J Epidemiol 1986; 124(3): 481-9.
9) Colditz GA, Branch LG, Lipnick RJ, et al. Moderate alcohol and decreased cardiovascular mortality in an elderly cohort. Am Heart J 1985; 109(4): 886-9.
10) Klatsky AL, Friedman GD, Siegelaub AB. Alcohol and mortality: A ten-year Kaiser-Permanente experience. Ann Intern Med 1981; 95: 139-45.
11) Kaprio J, Sarna S, Fogelholm M, Koskenvuo M. Total and occupationally active life expectancies in relation to social class and marital status in men classified as healthy at 20 in Finland. J Epidemiol Community Health 1996; 50: 653-60.

12) Martin LR, Friedman HS, Turker JS et al. An archival prospective study of mental health and longevity. Health Psychol 1995; 14(5): 381-7.
13) Bond GG, Lipps TE, Stafford BA, Cook RR. A comparison of cause-specific mortality among participants and nonparticipants in a work-site medical surveillance program. J Occup Med 1991; 33(6): 677-80.
14) Ott MG. Effects of selection and confounding on mortality in an occupational cohort. Dissertation. Ann Arbor, Michigan: University of Michigan, University Microfilms International, 1982.
15) Tilley BC, Johnson CC, Schultz LR, Buffler PA, Joseph CLM. Risk of colorectal cancer among automotive pattern and model makers. J Occup Med 1990; 32(6): 541-6.
16) Aoki K. Research activities of epidemiology in Japan - Report by the Research Committee of the Ministry of Education, Science, Sports and Culture on Evaluation of Risk Factors for Cancer. J Epidemiol 1996; 6(3)S: 107-13.
17) Watt GCM, Hart CL, Hole DJ, et al. Risk factors for cardiorespiratory and all cause mortality in men and women in urban Scotland : 15 year follow up. Scot Med J 1995; 40: 108-12.
18) Seidell JC, Verschuren WMM, van Leer EM, Kromhout D. Overweight, underweight, and mortality-A prospective study of 48,287 men and women. Arch Intern Med 1996; 156: 958-63.