ORIGINAL PAPER

Nagoya J. Med. Sci. **74**. 51 ~ 61, 2012

CARDIOVASCULAR DISEASE RISK FACTORS AMONG RURAL KAZAKH POPULATION

GULNARA KULKAYEVA[1,2], MD. HARUN-OR-RASHID[1], YOSHITOKU YOSHIDA[1], KAZBEK TULEBAYEV[3] and JUNICHI SAKAMOTO[1]

[1]Young Leaders' Program in Healthcare Administration, Nagoya University Graduate School of Medicine, Nagoya, Japan
[2]Primary Health Care Department of the Ministry of Health Care, Astana, Kazakhstan
[3]National Centre of Healthy Lifestyle Formation of Ministry of Health Care, Almaty, Kazakhstan

ABSTRACT

Cardiovascular diseases (CVDs) have remained a leading cause of mortality in Kazakhstan. The objectives of the present study were to estimate the prevalence of CVD risk factors (RFs) among the Kazakh population, and their ability to identify those CVD RFs. We interviewed 611 subjects aged 25–65 years using a structured self-administered questionnaire from April to July, 2008. Odds ratios (ORs) and 95% confidence intervals (CIs) were estimated to determine associations between CVD RFs and its correlations, such as socioeconomic status and level of knowledge of CVD RFs through a logistic regression model. Mean age of the respondents was 43.2 years, and 49.8% were male. Tobacco smoking, overweight (body mass index ≥25.0), hypertension (systolic blood pressure ≥140 mm Hg and diastolic blood pressure ≥90 mm Hg), and alcohol drinking were identified as important CVD RFs. Risk of overweight was greatest among the population aged 45–54 years, with an OR of 5.3 (95% CI=3.1–9.2). The overweight population was significantly associated with higher income (OR=1.6, 95% CI=1.1–2.4) and knowledge of RF (OR=1.7, 95% CI=1.2–2.4), with $p<0.05$. Only 25.0% of respondents had good knowledge about CVD RFs. Alcohol drinking was inversely related to the level of knowledge about CVD RFs (OR=0.7, 95% CI=0.5–0.9). We concluded that CVD RFs were very high among the Kazakh population, although their level of knowledge to identify those RFs was very low. Increasing knowledge about CVD RFs through awareness campaign activities can reduce CVD-related morbidity and mortality and ensure a better quality of life for the Kazakh population.

Key Words: Cardiovascular disease, Risk factors, Socioeconomic status, Rural, Kazakhstan

INTRODUCTION

Cardiovascular diseases (CVDs) are killing more and more people around the world, striking rich and poor alike[1)] and contributing significantly to the health costs in both developed and developing countries.[2)] Premature mortality as a result of CVD took second place in all countries of the Commonwealth of Independent States in a recent review, and was 3–4 times higher in Kazakhstan than in Western European countries.[1)] Continued morbidity, mortality and disability of people suffering from CVD, especially among the working population, greatly harms economic development and represents a high burden to society.[3,4)] CVD persists as a main killer, particularly

Corresponding Author: Junichi Sakamoto, MD, PhD, FACS
Young Leaders' Program in Healthcare Administration, Nagoya University Graduate School of Medicine, 65 Tsurumai-cho, Showa-ku, Nagoya 466-8550, Japan
Phone/Fax: +81-52-744-2444, E-mail: sakamjun@med.nagoya-u.ac.jp

among middle-aged males throughout Europe[4,5] and also in Kazakhstan.[6] In 2005, more than 30.0% of Kazakh people who died from CVD were of working age (20–65 years), and almost 70.0% were males.[6] In reality, the major causes of CVD are known, and if these risk factors (RFs) were eliminated, at least 80.0% of all CVDs could be prevented.[1,4]

Kazakhstan has implemented policies aimed at healthy lifestyle promotion over the past 10 years, and the 2007 national sociological study[7] showed a reduction in alcohol consumption compared to 1998 (35.6% versus 55.0%) along with a stabilization of the indicators of smoking (27.0% versus 28.0%). Knowledge of, and the ability to identify RFs, are essential components of behavior change and the decline of CVD.[2,8-13] The socioeconomic situation of a nation is also an important factor in the development and reduction of CVD as a whole, and at individual level. Until recently, CVD-related RFs and the diseases linked to them were more commonly associated with developed countries, but now they are becoming more prevalent in developing nations.[1,4] Several studies have revealed that the prevalence of CVD may rise with the increasing wealth of a population, and that previously, higher CVD prevalence had been associated with higher social status. In the majority of wealthy countries today, the higher CVD prevalence is associated with lower social classes because higher social classes are more likely to follow the recommendations for CVD prevention.[5]

Almost 50.0% of the Kazakh population live in rural areas. Although socioeconomic status (SES) is a significant independent variable of CVD RF development, its importance has yet to be fully clarified in our country. Many studies have documented strong associations between socioeconomic variables (education, occupation, income and marital status) and CVD development in countries with a various SESs[2,3,14-28] and also among rural or working age populations.[3,12,13,19,21] Only a few studies have explored this issue in countries with an economy in transition like former Soviet Union countries, such as Kazakhstan. Assessment and monitoring of the prevalence of CVD RFs and knowledge about them are essential for the initial development and implementation of targeted measures among population groups, particularly to reduce CVD-related mortality and morbidity of high-risk subjects, and to promote a healthy lifestyle. So far, there has been a great paucity of information concerning CVD RFs in Kazakhstan. Therefore, the objectives of the present work were to estimate CVD RF prevalence and the level of knowledge a rural working age population of Kazakhstan had to identify those CVD RFs, while taking into account socioeconomic characteristics.

MATERIALS AND METHODS

This cross-sectional study was conducted from April to July 2008. Data were collected from the primary health care (PHC) organizations of 26 rural villages of two districts of the West Kazakhstan region. A list of 10,642 eligible people 25–65 years old was obtained from the PHCs covering those 26 rural villages. Through systematic random sampling, we chose every 16th person from the list to achieve our desired 650 subjects for data collection. Because of their reluctance to be interviewed, absence from home, or illness during data collection, we could not interview some of the respondents. Some subjects with incomplete information were also excluded from the analysis. Finally, we obtained complete data from 611 (304 men and 307 women) with a response rate of 94%. The study group was a working age population (25–65 years), divided into 4 age groups (25–34, 35–44, 45–54 and 55–65). The survey, using a self-administered questionnaire, was conducted by nurses of PHC organizations situated in the localities of the study. During the first home visit, all data were collected with the questionnaire, except for anthropometric data. In the next two weeks, respondents were asked to come to the PHC organization for the

measurement of anthropometric data: height (cm), body weight (kg), waist circumference (cm), and thigh circumference (cm). Assessment of the studied RFs was conducted according to the standards recommended by the World Health Organization. Body mass index (BMI) was evaluated as normal (18.5–24.9 kg/m²) and overweight (≥25.0 kg/m²). Systolic blood pressure (SBP) ≥140 mm Hg and diastolic blood pressure (DBP) ≥90 mm Hg were defined as 'hypertension'.

In order to assess knowledge about CVD RFs, 10 different answers had been prepared. Each correct answer was scored as 1, and each wrong answer was scored as 0. A total score of 75.0% or more was treated as good knowledge and a total score less than 75.0% was treated as poor knowledge.[29] The study protocol was approved by the ethical committee (Academic Board) of the National Center of Healthy Lifestyle Formation of Ministry Health care, and also by the local ethics committee of the Western Kazakhstan Health Care Department. Moreover, all respondents gave their voluntary consent to participate in the study.

Statistical analysis

We used numbers and percentages to obtain all demographic and socioeconomic characteristics of respondents, and the chi-square test was used to compare differences in CVD RF-related knowledge by socioeconomic variables. To verify associations of CVD RFs with socioeconomic factors and knowledge, a logistic regression model was applied. A p value of <0.05 was considered significant. The Statistical Package for Social Science (SPSS) for Windows software (SPSS Inc., version 15, Chicago, USA) was used to analyze data.

RESULTS

Socio-economic characteristics of the respondents

Socioeconomic characteristics of the respondents are presented in Table 1. The average age of the respondents was 43.2 years, and a majority of them were from the Kazakh community (76.6%). The gender distribution was 49.8% male and 50.2% female, and overall, females were more educated than males. With regard to employment status, 39.8% of males were blue-collar workers engaged in hard physical labor. Female employees were white-collar workers usually engaged in sedentary activities with local government or private companies. However, 38.3% of the respondents were unemployed. Consequently, monthly income per family was not so high; almost three-quarters of the respondents had a family income of less the 36,000 tenge ($300) per month.

Knowledge of CVD RFs

Table 2 summarizes the percentage of the study population who could identify the RFs for CVD. More than half of the respondents could identify tobacco smoking (60.4%), alcohol drinking (64.8%), overweight (72.5%), and hypertension (49.9%) as RFs for CVD. While the ability to identify these RFs was higher among university-educated respondents, it was also satisfactorily identified by the less educated population.

As explained in Table 3, we found that only about a quarter of the respondents had a good level of knowledge and females were more knowledgeable than males (p=0.038). With regard to the education level, 43.8% of subjects with a university degree had significantly better knowledge than others (p<0.001). Employed subjects and higher income subjects also were likely to be more knowledgeable than the other groups (p=0.023 and p=0.022, respectively).

Table 1 Socioeconomic characteristics of respondents

	Male	Female	Total
	Number (%)	Number (%)	Number (%)
Total	304 (49.8)	307 (50.2)	611 (100.0)
Age group (years)			
25–34	69 (22.7)	73 (23.8)	142 (23.2)
35–44	81 (26.6)	72 (23.5)	153 (25.0)
45–54	90 (29.6)	91 (29.6)	181 (29.6)
55–65	64 (21.1)	71 (23.1)	135 (22.1)
Age (mean ± SD)	43.0±11.4	43.3±11.5	43.2±11.5
Marital status			
Married	251 (82.6)	231 (75.2)	482 (78.9)
Widow/divorced	9 (3.0)	42 (13.7)	51 (8.3)
Unmarried	44 (14.4)	34 (11.1)	78 (12.8)
Education level			
Below secondary	33 (10.9)	23 (7.5)	56 (9.2)
Secondary	136 (44.7)	134 (43.6)	270 (44.2)
College	100 (32.9)	105 (34.2)	205 (33.6)
University	35 (11.5)	45 (14.7)	80 (13.1)
Professional group			
Worker[a]	121 (39.8)	43 (14.0)	164 (26.8)
Employee	74 (24.3)	139 (45.3)	213 (34.9)
Unemployed	109 (35.9)	125 (40.7)	234 (38.3)
Nationality			
Kazakh	234 (77.0)	234 (76.2)	468 (76.6)
Russian	54 (17.8)	57 (18.6)	111 (18.2)
Minority	16 (5.3)	16 (5.2)	32 (5.2)
Monthly family income[b] (tenge)			
<36,000	235 (77.3)	207 (67.4)	442 (72.3)
≥36,000	69 (22.7)	100 (32.6)	169 (27.7)

[a]Worker means 'blue-collar workers' engaged in hard physical labor, [b]1USD=120 tenge

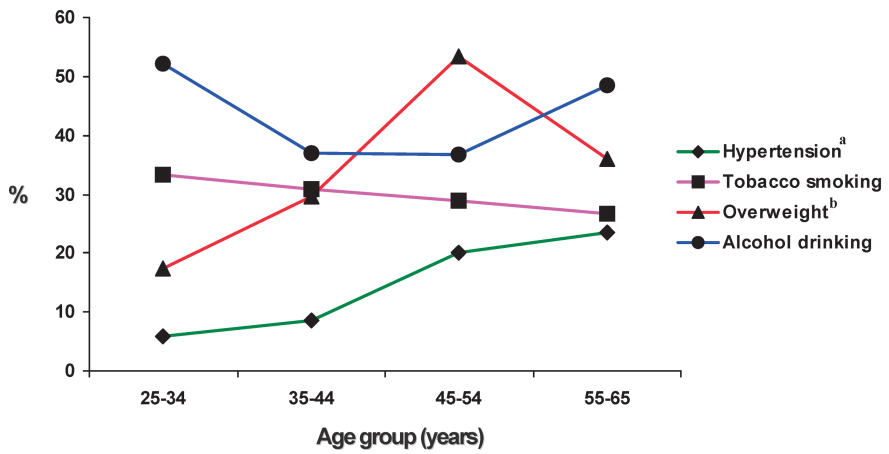

Fig. 1 Distributions of cardiovascular disease risk factors among males by age group. [a]Hypertension was defined as systolic blood pressure ≥140 mm of Hg and diastolic blood pressure ≥ 90 mm of Hg. [b]Overweight was defined as body mass index ≥25 kg/m^2, which also included obesity

Table 2 Percentage of study subjects who identified risk factors for cardiovascular diseases by socioeconomic characteristics

	Risk factors			
	Tobacco smoking	Overweight[a]	Alcohol drinking	Hypertension[b]
	Number (%)	Number (%)	Number (%)	Number (%)
Total	369 (60.4)	443 (72.5)	396 (64.8)	305 (49.9)
Age group (years)				
25–34	92 (64.8)	104 (73.2)	99 (69.7)	72 (50.7)
35–44	105 (68.6)	117 (76.5)	97 (63.4)	82 (53.8)
45–54	97 (53.6)	130 (71.8)	116 (64.1)	92 (50.8)
55–65	75 (55.6)	92 (68.1)	84 (62.2)	59 (43.7)
p value	0.016	0.462	0.558	0.390
Sex				
Male	168 (55.3)	211 (69.4)	194 (63.8)	153 (50.3)
Female	201 (65.5)	232 (75.6)	202 (65.8)	152 (49.5)
p value	0.010	0.088	0.608	0.840
Marital status				
Married	295 (61.2)	347 (72.0)	317 (65.8)	244 (50.6)
Widow/divorced	26 (51.0)	41 (80.4)	27 (52.9)	17 (33.3)
Unmarried	48 (61.5)	55 (70.5)	52 (66.7)	44 (56.4)
p value	0.356	0.404	0.177	0.030
Education level				
Below secondary	31 (55.4)	34 (60.7)	32 (57.1)	20 (35.7)
Secondary	164 (60.7)	192 (71.1)	165 (61.1)	137 (50.7)
College	110 (53.7)	158 (77.1)	136 (66.3)	97 (47.3)
University	64 (80.0)	59 (73.8)	63 (78.8)	51 (63.8)
p value	0.001	0.095	0.018	0.010
Professional group				
Worker[c]	93 (56.7)	118 (72.0)	103 (62.8)	74 (45.1)
Employee	141 (66.2)	162 (76.1)	156 (73.2)	126 (59.2)
Unemployed	135 (57.7)	163 (69.7)	137 (58.5)	105 (44.9)
p value	0.098	0.313	0.004	0.004
Monthly family income[d] (tenge)				
<36,000	264 (59.7)	315 (71.3)	278 (62.9)	211 (47.7)
≥36,000	105 (62.1)	128 (75.7)	118 (69.8)	94 (55.6)
p value	0.587	0.268	0.109	0.081

[a]Overweight: BMI ≥ 25.0; it also included obesity (BMI ≥ 30.0). [b]Hypertension: systolic blood pressure ≥ 140 mm of Hg and diastolic blood pressure ≥ 90 mm of Hg was treated as 'hypertension'. [c]Worker means 'blue-collar workers' engaged in hard physical labor. [d]1USD=120 tenge

Prevalence of CVD RFs

Fig. 1 describes the prevalence of CVD RFs among Kazakh male subjects. We found that tobacco smoking and alcohol drinking were more prevalent in the age group of 25–34 years, but smoking declined steadily with rising age, while alcohol drinking rapidly decreased by 35–44 years and again increased in the age group of 55–65 years. Overweight (BMI ≥ 25) was highest among the population age group of 45–54 years; however, it declined sharply in the age group of 55–65 years. Hypertension, as evidenced by SBP of ≥ 140 mm Hg and DBP of ≥ 90 mm Hg, was more common among the 45–54 year age group and rose to the highest level in the 55–65 years age group.

Fig. 2 elicits CVD RFs among the Kazakh female subjects. As expected, smoking prevalence was low among females, and was almost the same in all age groups. Alcohol drinking was

Table 3 Levels of knowledge of cardiovascular disease risk factors by socioeconomic status

	Level of knowledge		*p* value
	Poor	Good	
	Number (%)	Number (%)	
Total	459 (75.0)	152 (25.0)	0.170
Age group (years)	103 (72.5)	39 (27.5)	
25–34			
35–44	107 (69.9)	46 (30.1)	
45–54	142 (78.5)	39 (21.5)	
55–65	107 (79.3)	28 (20.7)	
Sex			
Male	239 (78.6)	65 (21.4)	
Female	220 (71.3)	87 (28.7)	0.038
Marital status			
Married	357 (74.1)	125 (25.9)	
Widow/divorced	44 (86.3)	7 (13.7)	
Never married	58 (74.4)	20 (25.6)	0.157
Education level			
Below secondary	48 (85.7)	8 (14.3)	
Secondary	206 (76.3)	64 (23.7)	
College	160 (78.0)	45 (22.0)	
University	45 (56.2)	35 (43.8)	<0.001
Professional group			
Worker[a]	129 (78.7)	35 (21.3)	
Employee	146 (68.5)	67 (31.5)	
Unemployed	184 (78.6)	50 (21.4)	0.023
Monthly family income[b] (tenge)			
<36,000	343 (77.6)	99 (22.4)	
≥36,000	116 (68.6)	53 (31.4)	0.022

[a]Worker means 'blue-collar workers' engaged in hard physical labor, [b]1USD=120 tenge

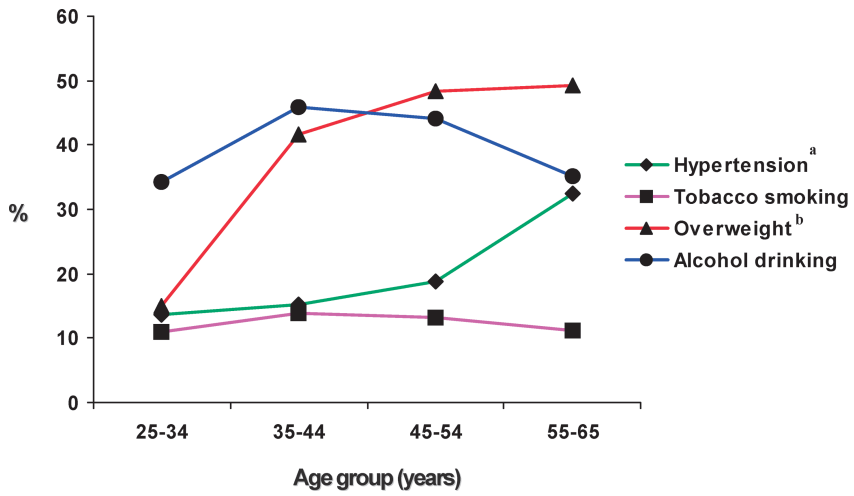

Fig. 2 Distributions of cardiovascular disease risk factors among females by age group. [a]Hypertension was defined as systolic blood pressure ≥140 mm of Hg and diastolic blood pressure ≥90 mm of Hg. [b]Overweight was defined as body mass index ≥25.

Table 4 Associations between risk factors for cardiovascular diseases and socioeconomic characteristics

	Tobacco smoking			Overweight[a]			Hypertension[b]			Alcohol drinking		
	No	Yes	OR[c]	No	Yes	OR	No	Yes	OR	No	Yes	OR
	Number (%)	Number (%)	(95% CI[d])	Number (%)	Number (%)	(95% CI)	Number (%)	Number (%)	(95% CI)	Number (%)	Number (%)	(95% CI)
Age group (years)												
25–34	111 (23.0)	31 (24.0)	1 (Reference)	119 (30.9)	23 (10.2)	1 (Reference)	128 (25.3)	14 (13.3)	1 (Reference)	81 (22.6)	61 (24.1)	1 (Reference)
35–44	118 (24.5)	35 (27.1)	1.1 (0.6–1.8)	100 (26.0)	53 (23.5)	2.8[e] (1.6–4.9)	135 (26.7)	18 (17.1)	1.2 (0.6–2.6)	90 (25.1)	63 (24.9)	0.9 (0.6–1.5)
45–54	143 (29.7)	38 (29.5)	1.0 (0.6–1.6)	89 (23.1)	92 (40.7)	5.3[e] (3.1–9.2)	146 (28.9)	35 (33.3)	2.2[f] (1.1–4.3)	108 (30.2)	73 (28.9)	0.9 (0.6–1.4)
55–65	110 (22.8)	25 (19.4)	0.8 (0.5–1.5)	77 (20.0)	58 (25.7)	3.9[e] (2.2–6.8)	97 (19.2)	38 (36.2)	3.6[e] (1.8–7.0)	79 (22.1)	56 (22.1)	0.9 (0.6–1.5)
Sex												
Male	213 (44.2)	91 (70.5)	1 (Reference)	198 (51.4)	106 (46.9)	1 (Reference)	260 (51.4)	44 (41.9)	1 (Reference)	174 (48.6)	130 (51.4)	1 (Reference)
Female	269 (55.8)	38 (29.5)	0.3[e] (0.2–0.5)	187 (48.6)	120 (53.1)	1.2 (0.9–1.6)	246 (48.6)	61 (58.1)	1.5 (1.0–2.2)	184 (51.4)	123 (48.6)	0.9 (0.6–1.2)
Marital status												
Married	372 (77.2)	110 (85.3)	1 (Reference)	296 (76.9)	186 (82.3)	1 (Reference)	399 (78.9)	83 (79.0)	1 (Reference)	282 (78.8)	200 (79.1)	1 (Reference)
Widow/ divorced	47 (9.8)	4 (3.1)	0.4 (0.1–1.2)	29 (7.5)	22 (9.7)	0.9 (0.5–1.7)	34 (6.7)	17 (16.2)	1.6 (0.8–3.2)	28 (7.8)	23 (9.1)	1.2 (0.7–2.2)
Unmarried	63 (13.1)	15 (11.6)	0.8 (0.4–1.4)	60 (15.6)	18 (8.0)	0.7 (0.4–1.2)	73 (14.4)	5 (4.8)	0.5 (0.2–1.2)	48 (13.4)	30 (11.9)	0.9 (0.5–1.5)
Education level												
Below secondary	46 (9.5)	10 (7.8)	1 (Reference)	40 (10.4)	16 (7.1)	1 (Reference)	41 (8.1)	15 (14.3)	1 (Reference)	34 (9.5)	22 (8.7)	1 (Reference)
Secondary	212 (44.0)	58 (45.0)	1.4 (0.7–3.0)	170 (44.2)	100 (44.2)	1.9 (1.0–3.7)	227 (44.9)	43 (41.0)	0.6 (0.3–1.3)	159 (44.4)	111 (43.9)	1.1 (0.6–2.0)
College	154 (32.0)	51 (39.5)	1.7 (0.8–3.7)	125 (32.5)	80 (35.4)	1.9 (1.0–3.7)	176 (34.8)	29 (27.6)	0.5 (0.2–1.0)	117 (32.7)	88 (34.8)	1.2 (0.7–2.2)
University	70 (14.5)	10 (7.8)	0.8 (0.3–2.0)	50 (13.0)	30 (13.3)	1.8 (0.8–3.0)	62 (12.3)	18 (17.1)	0.9 (0.4–2.0)	48 (13.4)	32 (12.6)	1.1 (0.5–2.1)
Professional group												
Worker[g]	118 (24.5)	46 (35.7)	1 (Reference)	109 (28.3)	55 (24.3)	1 (Reference)	145 (28.7)	19 (18.1)	1 (Reference)	91 (25.4)	73 (28.9)	1 (Reference)
Employee	174 (36.1)	39 (30.2)	0.8 (0.5–1.4)	121 (21.4)	92 (40.7)	1.4 (0.9–2.1)	172 (34.0)	41 (39.0)	1.6 (0.9–3.0)	125 (34.9)	88 (34.8)	0.9 (0.6–1.4)
Unemployed	190 (39.4)	44 (34.1)	0.8 (0.5–1.2)	155 (40.3)	79 (35.0)	0.9 (0.6–1.3)	189 (37.4)	45 (42.9)	1.5 (0.8–2.7)	142 (39.7)	92 (36.4)	0.8 (0.5–1.2)
Monthly family income[h] (tenge)												
<36,000	345 (71.6)	97 (75.2)	1 (Reference)	293 (76.1)	149 (65.9)	1 (Reference)	369 (72.9)	73 (69.5)	1 (Reference)	258 (72.1)	184 (72.7)	1 (Reference)
≥36,000	137 (28.4)	32 (24.8)	1.1 (0.7–1.7)	9223.9)	77 (34.1)	1.6[f] (1.1–2.4)	137 (27.1)	32 (30.5)	0.9 (0.6–1.5)	100 (27.9)	69 (27.3)	1.0 (0.7–1.5)
Knowledge												
Poor	351 (72.8)	108 (83.7)	1 (Reference)	299 (77.7)	160 (70.8)	1 (Reference)	379 (74.9)	80 (76.2)	1 (Reference)	253 (70.7)	206 (81.4)	1 (Reference)
Good	131 (27.2)	21 (16.3)	1.2 (0.8–1.8)	86 (22.3)	66 (29.2)	1.7[f] (1.2–2.4)	127 (25.1)	25 (23.8)	1.0 (0.7–1.4)	105 (29.3)	47 (18.6)	0.7[f] (0.5–0.9)
Total	482 (78.9)	129 (21.1)		385 (63.0)	226 (37.0)		506 (82.8)	105 (17.2)		358 (58.6)	253 (41.4)	

[a]Overweight: body mass index; BMI ≥ 25 kg/m^2 was treated as 'overweight'; it also included obesity. [b]Hypertension: systolic blood pressure ≥ 140 mm of Hg and diastolic blood pressure ≥ 90 mm of Hg was treated as 'hypertension'. [c]OR: odds ratio; ORs were adjusted for age and sex. In knowledge, OR was adjusted for age, sex, income, and education. [d]CI: confidence interval. [e]: $p<0.001$. [f]: $p<0.05$. [g]Worker means 'blue-collar workers' engaged in hard physical labor. [h]1USD=120 tenge.

highest in the age group of 35–44 years, and it declined gradually with growing age. Overweight was more pronounced in the age group of 35–44 years, and steadily rose until it peaked in the 55–65 year age group. However, unlike with males, the prevalence of hypertension was not different until the 45–54 year age group. Hypertension was at its highest among the age group of 55–65 years.

Association of CVD RFs with socioeconomic factors

Odds ratios (ORs) and 95% confidence intervals (CIs) were estimated through a logistic regression model to explore association between CVD RFs and socioeconomic factors. As shown in Table 4, females were less likely to be tobacco smoker than males (OR=0.3, 95% CI=0.2–0.5, $p<0.001$). Overweight was many times more likely among respondents of 45–54 (OR=5.3, 95% CI=3.1–9.2, $p<0.001$) and 55–65 years (OR=3.9, 95% CI=2.2–6.8, $p<0.001$). Age was also significantly associated with hypertension, especially for those aged 55–65 (OR vs. 25–34 were 3.6, 95% CI=1.8–7.0, $p<0.001$). Risk of overweight increased significantly among subjects with a higher income level (OR=1.6, 95% CI=1.1–2.4, $p=0.010$), and there was more hypertension (OR=1.6, 95% CI=0.8–3.2) among widow/divorced subjects compared with married.

People with a good level of knowledge were significantly less likely to be alcohol drinkers (OR=0.7, 95% CI=0.5–0.9, $p=0.027$) compared with less knowledgeable people. However, the risk of being overweight was more likely among respondents with a good level of knowledge and an OR of 1.7 (95% CI=1.2–2.4, $p=0.006$).

DISCUSSION

We identified a rural population with a very low level of knowledge about CVD RFs. Poor knowledge about CVD RFs and high prevalence of RFs demonstrated a clear relationship with socioeconomic indicators of respondents. Thus, levels of knowledge of the respondents were strongly associated with sex, education level, occupational status, and income. A good level of knowledge was further associated with a low risk of smoking and alcohol drinking, but at the same time, a high risk of being overweight.

Since Kazakhstan has conducted activities for healthy lifestyle formation in recent years, more than 60.0% of the studied population were able to identify at least one CVD RF. However, only 25.0% of the population could correctly assess the contributions the given factors have on the development of both hypertension and ischemic heart disease. Although various researchers have their own methods of assessing knowledge, an inadequate level of CVD RF knowledge also was revealed in their studies.[8-10,12,13] Our findings of low rates of RF identification and low levels of knowledge were reported in the same way by their studies. They reported that low levels of RF identification and low levels of knowledge among respondents were greatest among males,[9,29] aged participants.[9,11] those with a less education[9-11,29] and income,[9-11] and manual workers.[11] Education was the strongest predictor of CVD RF-related knowledge.[9-11] Despite the rural population being aware of CVD RFs, our study found that there was a low amount of knowledge about CVDs biological RFs, such as blood pressure and cholesterol.[10] This may be explained by a lack of appropriate healthcare promotion through the media and inadequate preventive measures of health care workers,[11] particularly from those in primary care, as well as inadequate preventive behavioral patterns.[10] Experience from developed countries has shown the adoption of measures to reduce RFs results in a significant reduction in premature mortality from CVDs.[2,4,16,30] However, good RF-related knowledge about CVD is not always an indicator of better health and healthy lifestyles. We revealed that many CVD RF-knowledgeable people still exhibited

unhealthy lifestyles, and therefore continued to have RFs related to CVD.[8] Evidence has shown that knowledge of disease is not enough to improve the perception of the people and attitudes towards behavioral changes.[8,11,19,29] The degree of effort people put towards a healthy lifestyle is a strong predictor of the achievement of educational and healthy life style interventions.

Our study revealed that tobacco smoking did not have a significant association with income. However, risk of overweight and hypertension were positively associated with higher income and occupational status.[5,19,26,29] The tendency of a relatively higher prevalence of BMI[18] and hypertension among employees can be explained by an association with more sedentary lifestyles,[22] with lack of physical activity, and with the stress burden of public service.[13] Stress at work and at home and depression make it more difficult for people to adopt and sustain a healthy lifestyle and impede lifestyle change.[5] We found a positive relationship between the level of income and overweight,[14,15,28] which was fully connected with Westernized nutrition[27] and lifestyles. Also, being overweight depends on the nutritional habits of the Kazakh population, where a meat and high calorie diet dominate. Furthermore, obesity is becoming just as dominant in developing countries, countries with economies in transition,[30] and in middle income[4] countries.

Although most studies show an inverse relationship between the prevalence of RF and income of rural populations,[3,19] we did not find such a relationship in our study except for overweight. There were also gender differences in the prevalence of excess body weight and hypertension. Whereas RFs sharply increased among the male group aged 45–54 years as compared with younger age groups, they increased gradually among women.

Although the present study clearly verified associations of CVD RFs prevalence with knowledge and socioeconomic characteristics, there were some limitations. This was a cross-sectional study and results do not show any evaluation of trends. We did not assess associations of other important RFs for CVD development, such as physical activity, because of the difficulty of standardizing results. Moreover, the rural areas did not have enough sport facilities for engaging in sport activities. We could not quantify alcohol consumption and measure the levels of cholesterol because of lack of laboratory accessibility in rural PHC organizations. However, different important factors which were revealed in our study can be used as a guideline for policy makers in planning and implementing programs and health-promotion campaigns designed to lower CVD-related mortality and morbidity.

In conclusion, CVD RFs were very high among the Kazakh population, although levels of knowledge for identifying those RFs were very low. This disparity of higher prevalence of RFs and little knowledge about them would surely put subjects at greater risk of cardiovascular diseases. Promotion of awareness programmes at the primary health care level with emphasis on changing behavioral RF can reduce CVD-related morbidity and mortality and make for a better quality of life of high-risk subjects.

ACKNOWLEDGMENTS

We would like to express our deep thanks to the following staff of the National Centre of Healthy Lifestyle Formation of the Ministry of Health Care for their support and assistance in conducting this study: T Slazhneva, SH Karzhaubaeva, A Zhylkaydarova, and B Rakhmanov. We would also like to convey special thanks to the Department of Health of the West Kazakhstan region for helping organize and conduct this study, in particular, M Aimurzieva. This work was supported in part by a non-profit organization “Epidemiological and Clinical Research Information Network (ECRIN).” We would also like to thank the Alfressa Foundation for their generous financial support as Corporate Social Responsibility (CSR).

REFERENCES

1) World Health Organization. The European health report 2005: Public health action for healthier children and populations. Copenhagen Ø, Denmark 2005 [March 15, 2009]; Available from: http://www.euro.who.int/__data/assets/pdf_file/0004/82435/E87325.pdf.
2) Nissinen A, Berrios X, Puska P. Community-based noncommunicable disease interventions: lessons from developed countries for developing ones. *Bull World Health Organ*, 2001; 79: 963–970.
3) Vescio MF, Smith GD, Giampaoli S. Socio-economic position and cardiovascular risk factors in an Italian rural population. *Eur J Epidemiol*, 2001; 17: 449–459.
4) World Health Organization. Preventing chronic diseases: a vital investment: WHO global report. Geneva, Switzerland: WHO Press; 2005 [Feb 28, 2009]; Available from: http://www.who.int/chp/chronic_disease_report/full_report.pdf.
5) Graham I, Atar D, Borch-Johnsen K, Boysen G, Burell G, Cifkova R, Dallongeville J, De Backer G, Ebrahim S, Gjelsvik B, Herrmann-Lingen C, Hoes A, Humphries S, Knapton M, Perk J, Priori SG, Pyorala K, Reiner Z, Ruilope L, Sans-Menendez S, Scholte op Reimer W, Weissberg P, Wood D, Yarnell J, Zamorano JL, Walma E, Fitzgerald T, Cooney MT, Dudina A, Vahanian A, Camm J, De Caterina R, Dean V, Dickstein K, Funck-Brentano C, Filippatos G, Hellemans I, Kristensen SD, McGregor K, Sechtem U, Silber S, Tendera M, Widimsky P, Altiner A, Bonora E, Durrington PN, Fagard R, Giampaoli S, Hemingway H, Hakansson J, Kjeldsen SE, Larsen ML, Mancia G, Manolis AJ, Orth-Gomer K, Pedersen T, Rayner M, Ryden L, Sammut M, Schneiderman N, Stalenhoef AF, Tokgozoglu L, Wiklund O, Zampelas A. European guidelines on cardiovascular disease prevention in clinical practice: executive summary. *Eur Heart J*, 2007; 28: 2375–2414.
6) Kulzhanov M, Rechel B. Kazakhstan: Health system review. *Health Systems in Transition*, 2007; 9: 1–158.
7) Ministry of Health. Public health and health care of the Republic of Kazakhstan in 2003–2007. Astana, Kazakhstan 2008.
8) Aekplakorn W, Suriyawongpaisal P, Sirirassamee B. Assessment of capacity for cardiovascular disease control and prevention in Thailand: a qualitative study. *Southeast Asian J Trop Med Public Health*, 2005; 36: 741–747.
9) Blades LL, Oser CS, Dietrich DW, Okon NJ, Rodriguez DV, Burnett AM, Russell JA, Allen MJ, Fogle CC, Helgerson SD, Gohdes D, Harwell TS. Rural community knowledge of stroke warning signs and risk factors. *Prev Chronic Dis*, 2005; 2: A14.
10) Jafary FH, Aslam F, Mahmud H, Waheed A, Shakir M, Afzal A, Qayyum MA, Akram J, Khan IS, Haque IU. Cardiovascular health knowledge and behavior in patient attendants at four tertiary care hospitals in Pakistan--a cause for concern. *BMC Public Health*, 2005; 5: 124.
11) Potvin L, Richard L, Edwards AC. Knowledge of cardiovascular disease risk factors among the Canadian population: relationships with indicators of socioeconomic status. *CMAJ*, 2000; 162: S5–11.
12) Tiwari R, Deb P, Debbarma A, Chaudhuri R, Chakraborty A, Lepcha M, Chakraborty G. Tobacco use and cardiovascular disease: a knowledge, attitude and practice study in rural Kerala. *Indian J Med Sci*, 2006; 60: 271–276.
13) Yiqui L, Wright SCD. Knowledge and awareness of risk factors for cardiovascular disease in the Ga-Rankuwa community. *Health SA Gesondheid* 2008; 13: 31–41.
14) Socio-economic status and risk factors for cardiovascular disease: a multicentre collaborative study in the International Clinical Epidemiology Network (INCLEN). The INCLEN Multicentre Collaborative Group. *J Clin Epidemiol*, 1994; 47: 1401–1409.
15) Baumann M, Spitz E, Guillemin F, Ravaud JF, Choquet M, Falissard B, Chau N. Associations of social and material deprivation with tobacco, alcohol, and psychotropic drug use, and gender: a population-based study. *Int J Health Geogr*, 2007; 6: 50.
16) Choiniere R, Lafontaine P, Edwards AC. Distribution of cardiovascular disease risk factors by socioeconomic status among Canadian adults. *CMAJ*, 2000; 162: S13–24.
17) De Vogli R, Chandola T, Marmot MG. Negative aspects of close relationships and heart disease. *Arch Intern Med*, 2007; 167: 1951–1957.
18) Fernald LC. Socio-economic status and body mass index in low-income Mexican adults. *Soc Sci Med*, 2007; 64: 2030–2042.
19) Hoang VM, Byass P, Dao LH, Nguyen TK, Wall S. Risk factors for chronic disease among rural Vietnamese adults and the association of these factors with sociodemographic variables: findings from the WHO STEPS survey in rural Vietnam, 2005. *Prev Chronic Dis*, 2007; 4: A22.

20) Kanjilal S, Gregg EW, Cheng YJ, Zhang P, Nelson DE, Mensah G, Beckles GL. Socioeconomic status and trends in disparities in 4 major risk factors for cardiovascular disease among US adults, 1971–2002. *Arch Intern Med*, 2006; 166: 2348–2355.
21) Le C, Chongsuvivatwong V, Geater A. Contextual socioeconomic determinants of cardiovascular risk factors in rural south-west China: a multilevel analysis. *BMC Public Health*, 2007; 7: 72.
22) Luoto R, Pekkanen J, Uutela A, Tuomilehto J. Cardiovascular risks and socioeconomic status: differences between men and women in Finland. *J Epidemiol Community Health*, 1994; 48: 348–354.
23) Myint PK, Luben RN, Welch AA, Bingham SA, Wareham NJ, Khaw KT. Effect of age on the relationship of occupational social class with prevalence of modifiable cardiovascular risk factors and cardiovascular diseases. A population-based cross-sectional study from European Prospective Investigation into Cancer - Norfolk (EPIC-Norfolk). *Gerontology*, 2006; 52: 51–58.
24) Nishi N, Makino K, Fukuda H, Tatara K. Effects of socioeconomic indicators on coronary risk factors, self-rated health and psychological well-being among urban Japanese civil servants. *Soc Sci Med*, 2004; 58: 1159–1170.
25) Reas DL, Nygard JF, Svensson E, Sorensen T, Sandanger I. Changes in body mass index by age, gender, and socio-economic status among a cohort of Norwegian men and women (1990–2001). *BMC Public Health*, 2007; 7: 269.
26) Reddy KS, Prabhakaran D, Jeemon P, Thankappan KR, Joshi P, Chaturvedi V, Ramakrishnan L, Ahmed F. Educational status and cardiovascular risk profile in Indians. *Proc Natl Acad Sci U S A*, 2007; 104: 16263–16268.
27) Sodjinou R, Agueh V, Fayomi B, Delisle H. Obesity and cardio-metabolic risk factors in urban adults of Benin: relationship with socio-economic status, urbanisation, and lifestyle patterns. *BMC Public Health*, 2008; 8: 84.
28) Woo J, Leung SS, Ho SC, Sham A, Lam TH, Janus ED. Influence of educational level and marital status on dietary intake, obesity and other cardiovascular risk factors in a Hong Kong Chinese population. *Eur J Clin Nutr*, 1999; 53: 461–467.
29) Kraywinkel K, Heidrich J, Heuschmann PU, Wagner M, Berger K. Stroke risk perception among participants of a stroke awareness campaign. *BMC Public Health*, 2007; 7: 39.
30) WHO. European Charter on counteracting obesity. WHO European Ministerial Conference on Counteracting Obesity; 2006 15–17 November, 2006; Isanbul, Turkey 2006.