Cardiovascular Risks in Kazakh Population in Xinjiang Province of China

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Aim: Assess the cardiovascular risks in Kazakh population in Ili of Xinjiang Province.

Methods: A total of 1126 participants (M/F: 443/683) aged ≥35 years, living in Ili for more than five years were selected via stratified random sampling. Fasting plasma glucose (FPG), blood lipids, body mass index (BMI), and blood pressure (BP) were measured. The risk was evaluated by 10-year risk estimation of ischemic cardiovascular disease (ICVD) in Chinese.

Results: The mean values of systolic blood pressure (SBP), body mass index (BMI), blood lipids were significantly higher in male than female ($P<.01$). The mean value (%) of 10-year morbid risk was higher in males than females aged <50 years ($P<.05$). A 10-year absolute risk of ICVD was <10% ($P=.536$) in 94.8% of males and 95.6% of females. The ratio of high-risk population (20%–40%) was higher in males than females (2.93% vs .73%, $P=.004$). There was significant difference in SBP, total cholesterol, and BMI among high, moderate, and low risk groups ($P<.05$).

Conclusion: Our study shows a high prevalence of cardiometabolic risks in the Kazakh population. Immediate short-term and sustainable long-term programs should be carried out to prevent the morbidity caused by known preventable risk factors. (*Ethn Dis.* 2014;24[3]:316–320)

Key Words: Cardiovascular Disease, Kazakh

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Introduction

Since the Framingham Heart Study contributed to the identification of risk factors for coronary heart disease (CHD), multivariable risk scoring methods incorporated in national guidelines to predict absolute CHD risk have served well in developed countries.[1–4] Liu et al[5] found that the original Framingham Study overestimated the CHD risk in the Chinese population. Furthermore, as risk factor patterns of cardiovascular disease are different in China,[6–7] and stroke is much more prevalent than CHD, Chinese researchers validated the main risk factors of cardiovascular diseases and developed appropriate prediction models and tools that could estimate the total cardiovascular risks (both CHD and stroke).[8] Be that as it may, all these studies focused only on mainland Chinese while little attention was paid to the primary risk factors of ischemic cardiovascular disease (ICVD) in the Kazakh population. Our research aimed to study the primary risk factors of ICVD in the Kazakh population in Ili of Xinjiang Province.

Methods

Participants

Our study was approved by the Ethics Committee of Xinjiang Medical University; it was conducted in accordance with the Helsinki Declaration. All participants provided informed written consent. A random population sample was identified in a rural area of Ili in Xinjiang Province of China. A total of 1126 participants aged ≥35 years and living in Ili for >5 years were selected by stratified random sampling and investigated with epidemiological methods.

Our research aimed to study the primary risk factors of ICVD in the Kazakh population in Ili of Xinjiang Province.

Data Collection

All participants refrained from smoking and drinking caffeinated beverages for ≥24 hours before being examined. They were interviewed by trained and certified observers using a structured questionnaire. The participants completed a self-administered questionnaire inquiring into their past and current medical history, intake of medications, and lifestyle. A trained nurse, using a standard mercury sphygmomanometer, measured blood pressure two times, consecutively, with the participant seated; the average of the two measurements was used for our analysis. Hypertension was defined as blood pressure of ≥140 mm Hg systolic (SBP) and/or ≥90 mm Hg diastolic (DBP) or being on antihypertensive therapies. Body mass index (BMI) was weight in kilograms divided by height in meters squared, and obesity was defined as BMI ≥30.[9] Height, weight, and waist circumference were obtained from each participant with standard protocols. Venous blood samples collected after overnight fasting were analyzed by standard automated methods for blood lipids and fasting plasma glucose (FPG). We defined diabetes mellitus as either a history of treatment or a fasting serum glucose level ≥126 mg/dL (7.0 mmol/L).[10] Dyslipidemia was defined as a ratio of total cholesterol to HDL-C of ≥4.5.[11]

Table 1. Characteristics of participants, mean ± SD

	Male	Female	*t*	*P*
n	443	683	-	-
Age, years	45.54 ± 6.93	44.75 ± 6.67	1.914	.056
BMI, kg/m^2	25.66 ± 3.78	23.90 ± 4.20	7.127	<.001
SBP, mm Hg[a]	131.26 ± 20.86	126.62 ± 21.77	3.545	<.001
Glucose, mmol/L	5.19 ± 1.69	4.94 ± 1.14	2.716	.007
Triglycerides, mmol/L	1.56 ± 1.20	1.21 ± .78	5.348	<.001
TC, mmol/L	4.89 ± 1.07	4.60 ± .93	4.727	<.001
HDL-C, mmol/L	1.34 ± .34	1.41 ± .31	3.599	<.001
LDL-C, mmol/L	3.29 ± 1.01	2.98 ± .88	5.406	<.001

[a] 1 mm Hg = .133 kPa.

BMI, body mass index; SBP, systolic blood pressure; DBP, diastolic blood pressure; TC, total cholesterol; HDL-C, high density lipoproteins cholesterol; LDL-C, low density lipoproteins cholesterol.

Judgment Standards of Results

According to *Chinese Prediction Model of Cardiovascular Diseases*, the value of six indices (individual age, current smoking status, diabetes mellitus [DM], BMI, SBP, and total cholesterol [TC]) were inserted into a formula to get an absolute morbidity risk of 10-year ischemic cardiovascular disease (ICVD).[12] Ischemic cardiovascular disease is a combined end point of events of coronary heart disease and cerebral ischemic stroke. Coronary heart disease events include acute myocardial infarction, coronary artery disease, or sudden cardiac death. Stroke events include hemorrhagic stroke including subarachnoid hemorrhage, ischemic cerebral stroke, and stroke that cannot be classified, except transient ischemic attack (TIA) and other types of cerebral diseases. According to risk value, the participants were divided into extreme high risk (≥40%), high risk (<40% and ≥20%), moderate risk (<20% and ≥10%), and low risk (<10%). Risk abnormality was defined as ≥10%.

Statistical Analysis

The data were analyzed with SPSS 13.0 statistical software. Data were presented as mean ± SD unless otherwise specified. The methods of analysis included *t* tests for continuous variables and χ^2 tests for the dichotomous parameters. Stepwise multiple linear regression was used to assess the independent relations between arteriosclerosis and risk factors. Comparisons for categorized variables were made using Fisher's exact test. Statistical significance was stated when the two-tailed *P* reached <.05.

RESULTS

Characteristics of Study Participants

The characteristics of study participants are shown in Table 1. The mean values of SBP, BMI, and blood lipids in males were significantly higher than those in females ($P<.01$), but there was no significant difference between the two groups in age (45.54 ± 6.93 vs 44.75 ± 6.67, $P=.056$). The rate of hypertension, smoking, diabetes mellitus, dyslipidemia, and obesity in males was significantly higher than in females (24.8% vs 19.6%, $P=.038$; 10.43% vs 7.98%; $P=.001$; 95.49% vs 98.39%, $P=.004$; 20.32% vs 6.00%, $P<.001$; 13.54% vs 9.08%; $P=.013$, respectively) (data not shown).

10-Year Morbidity Risk of Cardiovascular Diseases in Kazakh Population

Mean levels of 10-year morbidity risk of cardiovascular diseases of both sexes of the Kazakh population are shown in Table 2. The mean value (%) of risk of each age group in men was higher than that of corresponding age group in women ($P<.05$). Detection rates of abnormal absolute risk in both sexes are shown in Table 3. There was no significant difference in detection rate between males and females in absolute-risk (%) and low-risk groups (94.8% vs 95.6%, $P=.536$). Proportion of moderate-risk population (10%–20%) was more or less similar between two groups (3.66% vs 2.25%, $P=.185$), but the constituent ratio of high-risk population (20%–40%) was higher in males (2.93% vs .73%, $P=.004$). There was no significant difference between males and females in the above moderate risk groups ($x^2=.383$, $P=.536$).

The relationship between cardiovascular risk factors and mean levels of 10-year absolute risk are listed in Table 4. There was significant difference in levels of SBP, TC, and BMI among high, moderate, and low risk groups ($P<.05$), with the exception of FPG ($P=.354$). Kazakh males tended to have higher levels of SBP, FPG, TC, and BMI than females in the low risk groups ($P<.05$), while there was no significant difference in above moderate risk groups between males and females ($P>.05$). The detection rate of smoking was higher in high-risk groups in both sexes ($P<.05$), while Kazakh males tend to have a higher rate of smoking than females in the low-risk groups ($P<.001$).

Table 2. Mean level of morbidity risk in different sexes, mean ± SD

	Male		Female			
Age groups, years	*n*	Mean Level of Risk	*n*	Mean Level of Risk	*t*	*P*
35–39	100	1.064 ± .135	183	.954 ± .068	5.685	<.001
40–44	117	1.824 ± .863	194	.724 ± .272	4.838	<.001
45–49	92	2.660 ± .253	115	1.307 ± .183	3.086	.003
50–54	70	5.020 ± .471	114	3.368 ± .377	1.927	.05
55–59	64	7.900 ± .670	77	6.096 ± .802	1.405	.162

DISCUSSION

Cardiovascular disease risks are a result of the integration of multiple risk factors. The current clinical guidelines all adapted the strategy of applying interventions according to the magnitude of integrated risks. The Framingham Heart Study began its exploration in 1967 using prediction models to estimate the global risk of CHD for individuals.[1] However, the patterns of distribution may vary from group to group, so it does not fit Asians very well. In 2006, Wu et al[8] developed sex specific optimal 10-year risk prediction models for ICVD including ischemic stroke and coronary events from 17 years of follow-up data from the USA-PRC Collaborative Study of Cardiovascular Epidemiology cohort. The model showed ICVD positively related to age, SBP, serum TC, BMI, smoking, and diabetes mellitus in both men and women. Several studies demonstrated that the methods and tools of 10-year risk estimation of ICVD in Chinese adults work well.[13–16] However, we found from the previous studies that most researchers focused only on mainland Chinese and no one had applied the model to the Chinese Kazakh population, although they have more risk factors for ICVD. Therefore, using this prediction model and score tool and testing it in Kazakh population would be noteworthy. What is notable about doing this study in the Kazakh population is that the Kazakhs also live in Eastern Europe (Turkey) and northern parts of Central Asia, mostly Kazakhstan, followed by Uzbekistan, Russia, Mongolia, and China itself, and due to the cultural similarity of lifestyles and religion, our study could help to make a predictive model for Kazakhs living in those countries.

In China, the Kazakhs are an ethnic minority group, with a population of around 1,250,458, mainly living in the Ili Kazakh Autonomous Prefecture, Mori Kazakh Autonomous County, and Barkol Kazakh Autonomous County in the Xinjiang Uyghur Autonomous Region. Some are also located in Tibetan Kazakh Autonomous Prefecture in Qinghai Province and Aksay Kazakh Autonomous County in Gansu Province. Except for a few settled farmers, most of the Kazakhs live by animal husbandry. Yan et al[17] evaluated and compared the epidemiological and clinical features of metabolic syndrome in the Uyghur and Kazakh ethnic populations in 2005 and found that the prevalence of hypertension and central obesity in the Kazakh population was significantly higher than that of Uyghur population. Jing Tao et al[18] also researched the prevalence of major cardiovascular risk factors among Han, Ughyur, and Kazakh populations in the Xinjiang Ughyur Autonomous Region and found that hypertension, obesity, and smoking rates were higher among Kazakhs (54.6%, 24.5%, and 35.8%, respectively), which again demonstrated the importance of applying the prediction model and score tool and testing it in Kazakh population who tend to be at higher risks.

In our study, we observed a significant increase in ICVD with increasing age in the Kazakh population. Among main risk factors of participants in the study, mean values of SBP, DBP, and TC in males were significantly higher

Table 3. Mean levels of absolute risk in different sexes

			Risk≥10%							
	Risk <10%		<20%		20%–40%		≥40%		Total	
Groups	*n*	Constituent Ratio, %	*n*	Constituent Ratio, %	*n*	Constituent Ratio, %	*n*	Constituent Ratio, %	*n*	Constituent Ratio, %
Male	420	94.8[a]	10	2.26[b]	13	2.93[c]	0	0	23	5.19[d]
Female	653	95.6[a]	25	3.66[b]	5	.73[c]	0	0	30	4.39[d]

[a] x^2=.383, *P*=.536.
[b] x^2=1.756, *P*=.185.
[c] x^2=8.287, *P*=.004.
[d] x^2=.383, *P*=.536.

Table 4. Cardiovascular risks factors according to absolute risk, mean ± SD

Absolute risk	Risk Factors														
	SBP			TC			FPG			BMI			Smoking		
	Male	Female	*P*	Male	Female	*P*	Male	Female	*P*	Male	Female	*P*	Male	Female	*P*
<10%	128.06 ± 15.43	124.27 ± 18.47	<.001	4.88 ± 1.07	4.57 ± .93	<.001	5.15 ± 1.69	4.91 ± 1.15	.01	25.13 ± 3.79	23.23 ± 4.09	<.001	59.29%	27.87%	<.001
≥10%	189.61 ± 21.39	177.83 ± 25.38	.079	5.25 ± 1.23	5.26 ± 1.01	.969	5.29 ± 1.08	5.12 ± .85	.51	26.48 ± 3.46	27.70 ± 5.05	.325	73.91%	80%	.6
P		<.001			<.001			.354			<.001			<.001	

SBP, systolic blood pressure; TC, total cholesterol; FPG, fasting plasma glucose; BMI, body mass index.

In our study, we observed a significant increase in ICVD with increasing age in the Kazakh population.

than in females. The mean value (%) of 10-year morbidity risk was higher in men than women aged <50 years ($P<.05$), but there was no difference in those aged >50 year($P\geq.05$). This may suggest that several important risk factors of cardiovascular diseases have superimposed the effects of each other on the onset of disease. In addition, we found risk factors were greater in Kazakh males than Chinese males aged >45 years, and mean levels of 10-year morbid risk for cardiovascular diseases in both sexes of Kazakhs were more than those of mainland Chinese.

We found significant differences in the level of SBP, TC, and BMI among low, moderate, and high-risk groups. The cardiovascular risk factors were more common in moderate-and high-risk populations than low-risk groups, which could make this method appropriate for detecting the high-risk individuals in the Kazakh population.

CONCLUSION

A potential weakness of our study is that the study population was aged 35–59 years, thus limiting applicability to those aged ≥60 years. Also, our method only estimates the risk of developing ICVD within a 10-year time period, so caution should be taken when applying these results to young persons. Several strengths of our study include: the large cohort of individuals from the community, and our use of uniform protocols including questionnaires, anthropometric measurements, assessment of conventional risk factors, and the ABI measure. We believe our results will further understanding of the status of primary risk factors of cardiovascular diseases in the Kazakh population and provide scientific evidence for formulation of communal control strategies for cardiovascular and cerebrovascular diseases in Xinjiang Province.

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REFERENCES

1. Truett J, Cornfield J, Kannel WB. A multivariate analysis of the risk of coronary heart disease in Framingham. *J Chronic Dis*. 1967;20(7):511–524.
2. Kannel WB. Office assessment of coronary candidates and risk factor insights from the Framingham study. *J Hypertens*. 1991;9(suppl7):S13–S19.
3. Wilson PWF, D'Agostino RB, Levy D, Belanger AM, Silbershatz H, Kannel WB. Prediction of coronary heart disease using risk factor categories. *Circulation*. 1998;97:1837–1847.
4. Conroy RM, Pyorala K, Fitzgerald AP, et al. on behalf of the SCORE Project. Estimation of ten-year risk of fatal cardiovascular disease in Europe: the SCORE project. *Euro Heart J*. 2003;24(11):987–1003.
5. Liu J, Hong Y, D'Agostino RB Sr, et al. Predictive value for the Chinese population of the Framingham CHD risk assessment tool compared with the Chinese Multi-Provincial Cohort Study. *JAMA*. 2004;291(21):2591–2599.
6. Zhou B, Zhang H, Wu Y, et al. Ecological analysis of the association between incidence and risk factors of coronary heart disease and stroke in Chinese populations. *CVD Prev*. 1998;1(3):207–216.
7. Grundy SM, D'Agostino RB Sr, Mosca L, et al. Cardiovascular risk assessment based on US Cohort studies: findings from a National Heart, Lung, and Blood Institute workshop. *Circulation*. 2001;104:491–496.
8. Yangfeng Wu, Xiaoqing Liu, Xian Li, et al. Estimation of 10-Year Risk of Fatal and Nonfatal Ischemic Cardiovascular Diseases in Chinese Adults. *Circulation*. 2006;114:2217–2225.
9. Wu Y, Zhou B, Tao S, et al. Prevalence of overweight and obesity in Chinese middle-aged populations: Current status and trend of development. *Chin J Epidemiol*. 2002;23(1):11–15.
10. The Expert Committee on the Diagnosis and Classification of Diabetes Mellitus. Report of the expert committee on the diagnosis and classification of diabetes mellitus. *Diabetes Care*. 2003;26(suppl 1):S2–S20.

11. Brown CD, Higgins M, Donato KA, et al. Body Mass Index and the Prevalence of Hypertension and Dyslipidemia. *Obes Res*. 2000;8(9):605–619.
12. The Collaborative Research Group of the National 10th Five-Year Plan Project: A Study on Evaluation and Intervention of the Coronary Heart Disease and Stroke Integrated Risk. A study on evaluation of the risk of ischemic cardiovascular diseases in Chinese and the development of simplified tools for the evaluation. *Chin J Cardiol*. 2003;31(12):893–901.
13. Zhang XF, Attia J, D'Este C, Yu XH, Wu XG. A risk score predicted coronary heart disease and stroke in a Chinese cohort. *J Clin Epidemiology*. 2005;58(9):951–958.
14. Li HF, Wang P, Wang HY, Xu L, Yang DS, Jia SD. Perform analyse on the predictive model of ischemic cardiovascular diseases in Qingdao. *Chin J Cardiol*. 2005;33(2):178–180.
15. Xi-zhuo S, Xue W, Xiao-fang P, et al. Investigation of the prevalence and distributing feature of cardiovascular disease risk factors in Zhangzi island of Dalian. *Chin J Cardiovasc Med*. 2008;13(4):82–85.
16. Wei W, Dong Z, Jing L, et al. Prospective study on the predictive model of cardiovascular disease risk in a Chinese population aged 35–64. *Chin J Cardiol*. 2003;31(12):902–908.
17. Wei-li Y, Xiao-yan Y, Yu-jian Z, et al. The Metabolic Syndrome in Ughyur and Kazak Populations. *Diabetes Care*. 2005;28(10): 2554–2555.
18. Jing T, Yi-tong M, Yang X, et al. Prevalence of major cardiovascular risk factors and adverse risk profiles among three ethnic groups in the Xinjiang Ughyur Autonomous Region, China. *Lipids Health Dis*. 2013;12:185.

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