Original Article
Analysis of the risk factors and characteristics of coronary artery disease of Han, Uygur and Kazak patients with acute myocardial infarction in Xinjiang district

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Abstract: To discuss the risk factors and characteristics of coronary artery disease of Han, Uygur and Kazak patients with acute myocardial infarction in Xinjiang district. A retrospective analysis of clinical data of 262 cases of Han patients, 166 cases of Uygur patients and 86 cases of Kazak patients was conducted, whose age, body mass index, cholesterol, uric acid, hypertension, type 2 diabetes, smoking, drinking, family history of coronary heart disease, relationship between PCI history and pathogenesis of acute myocardial infarction, and coronary artery disease characteristics were observed and compared in different groups. Between the Han and minority young patients, there were statistically significant differences in the distribution of BMI, lipoprotein a, positive family history of coronary heart disease, uric acid level, the combined aspects of smoking history (P<0.017); there were also statistically significant differences in BMI, TG, HDL-C, apolipoprotein B, positive family history of coronary heart disease distribution between minority young patients and older patients (P<0.017). There were statistically significant differences in the distribution of BMI, TC, HDL-C, LDL-C, apolipoprotein AI, positive family history of coronary heart disease between Han and Uygur patients (P<0.017). Han and Kazak patients had statistically significant differences in the distribution of BMI, TC, LDL-C, apolipoprotein B, lipoprotein a, type 2 diabetes and hypertension (P<0.017). Comparison of patients in Uygur and Kazak showed that there were statistically significant differences in the distribution of BMI, TC, LDL-C, apolipoprotein AI, apolipoprotein B and type 2 diabetes between the two groups (P<0.017). The proportion of zero lesions and single-vessel lesions in minority youth patients was higher than that of elderly patients (P<0.001), and the proportion of two and three lesions was less than that of elderly patients (P<0.001). Gensini score of Han patients was greater than that of Uygur patients (P<0.001) and the Kazak patients (P=0.005); The proportion of Han patients with single-vessel disease was less than that of Kazak patients (P=0.003), and the proportion of patients with double-vessel disease was greater than that of Kazak patients (P=0.007). There were ethnic differences in risk factors and the characteristics of coronary artery disease of AMI patients in Xinjiang district; there were differences between minority youth patients and elderly patients, young patients of Han.

Keywords: Acute myocardial infarction, minority, risk factors, coronary artery disease

Introduction

With the development of social and economic and the changes of people's lifestyle, cardiovascular disease has become one of the major diseases that threaten human health in today's society. Acute myocardial infarction (acute myocardial infarction, AMI) is a severe type of coronary heart disease. The onset of the disease is abrupt, with rapid development, and easy to occur sudden cardiac death, which is affected by many factors and the difference exist in race

and geographic region. Since advent of Framingham's study [1], scholars conducted a series of studies which were concentrated on the traditional risk factors for coronary heart disease (such as hypertension, diabetes, high cholesterol, etc.) and new-onset risk factors (obesity, psychosocial factors, etc). However, due to the existence of ethnic groups, geographic, age and other differences, the relative importance of risk factors is different. The characteristic of coronary lesions is not the same [2-4]. Xinjiang is a multi-ethnic gathering area.

Table 1. Minority youth, minority elderly patients compared with the general situation of young Han ($\bar{x} \pm s$)

Project	Minority Youth n=52	Minority Elderly n=200	Han Young n=53	P values
Age	40.7±3.4	57.7±8.1	40.6±3.9	<0.001[b]
BMI	26.90±2.87	25.58±3.03	24.76±3.18	0.002[a,b]
SP	121.7±17.2	125.0±23.7	139.1±13.5	0.154
DP	75.8±10.5	75.6±14.0	78.5±13.6	0.369
Uric acid	320.51±88.33	310.24±81.06	365.28±99.22	<0.001[a]
TG	2.42±1.63	1.69±0.97	1.96±1.43	0.001[b]
TC	4.13±1.33	3.85±1.00	3.91±1.09	0.264
HDL-C	0.78±0.24	0.88±0.26	0.90±0.24	0.029[b]
LDL-C	2.61±1.17	2.40±0.81	2.45±0.75	0.300
Apolipoprotein AI	1.04±0.23	1.04±0.28	1.08±0.27	0.619
Apolipoprotein B	0.93±0.31	0.81±0.26	0.83±0.32	0.027[b]
Lipoprotein a	292.77±175.74	236.83±169.61	209.81±148.62	0.036[a]
Family history of coronary heart disease [patients (%)]	22 (42.31)	36 (18.00)	7 (13.21)	<0.001[a,b]
Smoking history				
Had already quit suck [cases (%)]	2 (3.85)	12 (6.00)	1 (1.87)	0.005[a]
Are still suck [cases (%)]	30 (57.69)	108 (54.00)	44 (83.02)	
Hypertension				
Drug control [cases (%)]	6 (11.54)	40 (20.00)	9 (16.98)	0.107
Uncontrolled [cases (%)]	8 (15.38)	48 (24.00)	7 (13.21)	
Drinking history [cases (%)]	12 (23.08)	50 (25.00)	13 (24.53)	0.960
Diabetes [cases (%)]	2 (3.85)	26 (13.00)	4 (7.55)	0.126
PCI previous history [cases (%)]	6 (11.54)	10 (5.00)	7 (13.21)	0.066

Note: After three pairwise comparisons between groups adjusted significance level P<0.017. [a]: Youth group youth groups and Han ethnic minorities, P^a<0.017; [b]: Minority and minority youth group aged group, P^b<0.017.

At the same time, it is also an area with high incidence of coronary heart disease. Studies have shown [5-7] that the morbidity and mortality rates of coronary heart disease in Uygur and Kazak are higher than that in the Han. The coronary artery lesion is severe, with a higher incidence of the three diseases and the main lesion differences exist in the ethnic. This study retrospectively analyses part of the risk factors in Han, Uygur and Kazak patients with AMI and coronary artery lesions, in order to understand the clinical characteristics and differences, and provide data support for the prevention of acute myocardial infarction in different races.

Materials and methods

Subjects

Hospitalized Uighur patients (166 cases) and Kazakh patients (86 cases) at the First Affiliated Hospital of Xinjiang Medical University from July 2012 to December 2013 were selected, who were confirmed to be acute myocardial infarction patients and treated with coronary angiog-

raphy; and the Han hospitalized patients (262 cases) were randomly selected in the same period. Firstly, the patients were divided into minority youth group (age ≤44 years old, Uygur and Kazak), minority elderly group (age >44 years old, Uygur and Kazak) and Han youth group (age ≤44 years old); secondly grouping was conducted by ethnics. The clinical data were collected on admission, including age, body mass index (BMI), systolic blood pressure, diastolic blood pressure, triglyceride (TG), total cholesterol (TC), high density lipoprotein (HDL-C), low density lipoprotein (LDL-C), apolipoprotein AI, apolipoprotein B, lipoprotein a, uric acid, smoking, drinking history, family history of coronary heart disease, PCI history, hypertension and type 2 diabetes. According to the results of coronary angiography, severity of coronary artery was assessed, and diseased coronary artery vessel numbers were recorded as 0, 1, 2, 3 diseased coronary artery vessels; culprit vessels were record as left anterior descending artery (LAD), circumflex artery (LCX) and right coronary artery (RCA) lesions.

Table 2. Patients generally compare various nationalities ($\overline{x}\pm s$)

Project	Han n=262	Uighurs n=166	Kazak n=86	P values
Age	56.3±11.2	53.9±9.6	54.6±11.0	0.075
BMI	24.49±2.68	25.46±2.92	26.69±3.11	<0.001[c,d,e]
SP	125.2±54.3	122.1±21.2	128.7±24.4	0.474
DP	76.9±15.1	74.6±13.6	77.6±12.6	0.176
Uric acid	324.67±99.16	309.89±74.79	315.83±94.89	0.269
TG	1.73±1.25	1.96±1.30	1.63±0.84	0.076
TC	3.95±1.01	3.67±0.88	4.36±1.25	<0.001[c,d,e]
HDL-C	0.92±0.23	0.84±0.24	0.91±0.29	0.002[c]
LDL-C	2.50±0.82	2.25±0.80	2.79±0.97	<0.001[c,d,e]
Apolipoprotein AI	1.11±0.28	1.00±0.27	1.12±0.26	<0.001[c,e]
Apolipoprotein B	0.83±0.26	0.77±0.21	0.93±0.35	<0.001[d,e]
Lipoprotein a	223.13±172.62	231.62±163.90	279.06±183.14	0.032[d]
Family history of coronary heart disease [patients (%)]	40 (15.27)	42 (25.30)	16 (18.60)	0.036[c]
Smoking history				
Had already quit suck [cases (%)]	31 (11.83)	10 (6.02)	4 (4.65)	0.110
Are still suck [cases (%)]	142 (54.20)	88 (53.01)	50 (58.14)	
Hypertension				
Drug control [cases (%)]	77 (29.39)	30 (18.07)	16 (18.60)	0.006[d]
Uncontrolled [cases (%)]	38 (14.50)	32 (19.28)	24 (27.91)	
Drinking history [cases (%)]	63 (24.05)	44 (26.51)	18 (20.93)	0.613
Diabetes [cases (%)]	47 (17.94)	26 (15.66)	2 (2.33)	0.002[d,e]
PCI previous history [cases (%)]	14 (5.34)	12 (7.23)	4 (4.65)	0.644

Note: After three pairwise comparisons between groups adjusted significance level P<0.017. [c]: Han group and Uighur groups, P^c<0.017; [d]: Han ethnic group and the Kazak group, P^d<0.017; [e]: Uygur ethnic group and the Kazakh group, P^e<0.017.

Study inclusion criteria

Enrolled patients met the diagnostic criteria of AMI, or carried a diagnostic clinical data on admission. According to the age segments of WTO in 2013, people under the age of 44 were defined as youths, so patients were classified as youth and old groups by this. Medical history, blood tests and surgical records were complete during hospitalization. Exclusion criteria: patients with congenital heart disease, cardiomyopathy, aortic disease, coronary artery abnormalities, severe infections, severe liver and kidney dysfunction. Acute myocardial infarction appeared in the surgery, interventional therapy and other medical practices.

Diagnostic criteria for acute myocardial infarction

According to the global uniform definition of myocardial infarction [8], it must meet at least two of the following three criteria, typical history of angina; characteristic ECG changes; dynamic evolution in the concentrations of serum cardiac markers.

Standards of risk factors

Positive family history of coronary heart disease means that first-degree relatives (parents, siblings with same parents) had coronary heart disease; according to "Chinese Hypertension Prevention Guide 2010" [9], hypertension was defined as: in the resting state (no medication), blood pressure has increased two times in the continuous three measurements (systolic blood pressure (SP) ≥140 mmHg and (or) the diastolic pressure (DP) ≥90 mmHg), or with clear hypertension history; according to "Chinese type 2 diabetes Prevention Guide (2007 edition)" [10], type 2 diabetes was defined as: symptoms of diabetes plus random blood glucose ≥11.1 mmol/L or fasting blood glucose ≥7.0 mmol/L or glucose in 2 hours after load of 75 g glucose ≥11.1 mmol/L; continuous smoking is defined as: smoking ≥1 cigarettes per day, more than a year of continuous smoking; Smoking cessation was defined as complete smoking cessation more than one year; according to "Chinese adult dyslipidemia prevention Guide" [11], dyslipidemia was defined as: total cholesterol (TC) ≥5.18 mmol/L, low-density lipoprotein (LDL-C)

Table 3. Minority youth, minority and Han elderly compare coronary lesions in young patients

Coronary lesions	Minority youth n=52	Minority Elderly n=200	Han Young n=53	P values
Number of branch vessels				<0.001[b]
0 [cases (%)]	6 (11.54)	4 (2.00)	2 (3.77)	
1 [cases (%)]	24 (46.15)	68 (34.00)	29 (54.72)	
2 [cases (%)]	18 (34.62)	70 (35.00)	13 (24.53)	
3 [cases (%)]	4 (7.69)	58 (29.00)	9 (16.98)	
Culprit vessel				0.109
LAD [cases (%)]	30 (57.69)	103 (51.50)	29 (54.72)	
LCX [cases (%)]	10 (19.23)	35 (17.50)	14 (26.41)	
RCA [cases (%)]	6 (11.54)	58 (29.00)	10 (18.87)	
Gensini score	33.68±23.07	40.85±25.18	42.85±26.39	0.131

Note: After three pairwise comparisons between groups adjusted significance level P<0.017. [a]: Youth group youth groups and Han ethnic minorities, P[a]<0.017; [b]: Minority and minority youth group aged group, P[b]<0.017.

±s; Comparisons among three groups and more than three groups were analyzed using analysis of variance; differences between groups were compared using LSD; count data were analyzed using the x^2 test; α=0.05, P<0.05 was considered statistical different; in further pairwise comparison, the significance level was adjusted to P<0.05/n, ie, P<0.017, according to the number of comparisons (n).

≥3.37 mmol/L, high-density lipoprotein (HDL-C) <1.04 mmol/L, triglycerides (TG) ≥1.70 mmol/L.

Determination of the extent of coronary artery disease

According to the criteria of American Heart Association [12], coronary stenosis ≥50% was diagnosed as coronary stenosis. According to the affected coronary artery disease, coronary artery disease was divided into 0, 1, 2, 3 diseased coronary artery vessels; the cumulative left main was calculated as the cumulative anterior descending artery plus circumflex artery anterior. Gensini score [13]: stenosis <25% was recorded as 1 point, 25%-49% was marked as 2 points, 50%-74% was noted as 4 points, 75%-90% was noted as 8 points, 91%-99% was recorded as 16 points, 100% was recorded as 32 points. Factor: LM ×5, LCX opening ×3.5; left anterior descending artery, circumflex artery near, middle and far segments respectively ×2.5, 1.5, 1; right coronary ×1; D1 diagonal branch ×1; D2 diagonal branch ×0.5; left ventricular posterior branch ×1; obtuse marginal branch ×1, right posterior descending branch ×1, posterior collateral ×0.5. Gensini score=Σ (coronary stenosis × lesion factor).

Statistical analysis

Epidata 3.1 was used to input data. SPSS-18.0 statistical software was used to analyze data; measurement data were described as $\bar{x}$

Results

General comparison among minority youth group, minority aged group and Han youth group

Between the Han and minority young patients, there were statistically significant differences in the distribution of BMI, lipoprotein a, positive family history of coronary heart disease, uric acid level, the combined aspects of smoking history (P<0.017); there were also statistically significant differences in BMI, TG, HDL-C, apolipoprotein B, positive family history of coronary heart disease distribution between minority young patients and older patients (P<0.017, **Table 1**).

The general comparison among various ethnic groups

There were statistically significant differences in the distribution of BMI, TC, HDL-C, LDL-C, apolipoprotein AI, positive family history of coronary heart disease between Han and Uygur patients (P<0.017).

Han and Kazak patients had statistically significant differences in the distribution of BMI, TC, LDL-C, apolipoprotein B, lipoprotein a, type 2 diabetes and hypertension (P<0.017). Comparison of patients in Uygur and Kazak showed that there were statistically significant differences in the distribution of BMI, TC, LDL-C, apo-

Table 4. Comparison of coronary artery disease in patients with various ethnic groups

Coronary lesions	Han n=262	Uighurs n=166	Kazak n=86	P values
Number of branch vessels				0.006[e]
0 [cases (%)]	10 (3.82)	10 (6.02)	0 (0)	
1 [cases (%)]	82 (31.30)	52 (31.33)	40 (46.51)	
2 [cases (%)]	78 (29.77)	66 (39.76)	22 (25.58)	
3 [cases (%)]	92 (35.11)	38 (22.89)	24 (27.91)	
Culprit vessel				0.704
LAD [cases (%)]	140 (53.44)	82 (49.40)	50 (58.14)	
LCX [cases (%)]	45 (17.18)	32 (19.28)	14 (16.28)	
RCA [cases (%)]	67 (25.57)	42 (25.30)	22 (25.58)	
Gensini score	53.18±32.02	49.81±33.02	52.30±26.60	<0.001[c,d]

Note: After three pairwise comparisons between groups adjusted significance level P<0.017. [c]: Han group and Uighur groups, $P^c<0.017$; [d]: Han ethnic group and the Kazakh group, $P^d<0.017$; [e]: Uygur ethnic group and the Kazakh group, $P^e<0.017$.

lipoprotein AI, apolipoprotein B and type 2 diabetes between the two groups (P<0.017, **Table 2**).

Comparison of coronary angiography among minority youth group, minority aged group and Han youth group

The proportion of zero lesions and single-vessel lesions in minority youth patients was higher than that of elderly patients (P<0.001), and the proportion of two and three lesions was less than that of elderly patients (P<0.001, **Table 3**).

Comparison of coronary angiography among different ethnic groups

Gensini score of Han patients was greater than that of Uygur patients (P<0.001) and the Kazak patients (P=0.005); the proportion of Han patients with single-vessel disease was less than that of Kazak patients (P=0.003), and the proportion of patients with double-vessel disease was greater than that of Kazak patients (P=0.007, **Table 4**).

Discussion

Many studies indicated that smoking, obesity, dyslipidemia, hypertension, diabetes, positive family history, etc were traditional risk factors for coronary heart disease in acute myocardial infarction. Imazio's study showed that [14], smoking, hypercholesterolemia and positive family history are the risk factor for young people with AMI. As for older people, high blood pressure and diabetes were the base. The results of this study showed that the BMI, dyslipidemia level (high TG, apolipoprotein B, low HDL-C) and the proportion of positive family history of coronary heart disease was significantly higher than of elder patients in minority youth patients, which is partly consistent with previous findings. However, the BMI, lipoprotein (a) levels and the proportion of positive family history of coronary heart disease in minority youth patients were higher than that of Han patients. The uric acid levels, smoking history proportion are less than that of Han race. The analytic reasons were as followed: Smoking is one of the globally recognized risk factors for acute myocardial infarction. Howard [15] and other studies have shown that smoking correlated with the development of atherosclerosis, which is an independent variable risk factor. Zhang Weiping's [16], further study has shown that smoking and positive family history is a major risk factor for under age of 40 AMI patients. This study demonstrated that for patients with AMI in minorities, the proportion of smokers in the youth and the elder was less.

But smokers in Han young AMI patients were significantly more than that of ethnic minorities. This may be related to the inhabited areas of ethnic minority, the traditional customs and religious culture. For example, Tianshan Mountains planted tobacco co-Mo and Uighur men both young and old were favorite in smoking co-Mo cigarette. While almost no minority women smoking, which may be one of the causes of these differences.

The abnormal blood lipid levels closely correlate with the atherosclerosis, which is also one of the major risk factors leading to the acute myocardial infarction. This study demonstrated that, compared with the old patients, the abnormal lipid levels in minority youth patients were mainly in high TG, apolipoprotein B, lipoprotein

(a) and low HDL-C based. There was only a statistical significant difference in lipoprotein (a) with the Han young patients, which was inconsistent with Liu's result [17]. But the result equally suggested that the level of abnormal blood lipid played a more important role in the youth with acute myocardial infarction. We concluded that the reasons may be associated with obesity, irrational diet structure, irregular lifestyle and high mental stress among young people. This result can further guide us to conduct primary prevention of acute myocardial infarction. In this study, the levels of BMI were as follows: Minority youth > minority elderly > Han Young. High level of BMI was easy to increase endothelial cell dysfunction, releasing excessive fatty acids and cytokines, which may lead to insulin resistance. Thereby the accumulated micro-thrombosis and leukocyte aggregation lead to coronary thrombosis [18]. Xinjiang Minority, were favorite in eating beef and mutton. Especially those living in pastoral areas Kazak, they were meat-based almost all year round and rarely ate vegetables. Such a lifestyle may also lead to a higher level of BMI and lipids in minority patients than that in than Han patients.

The proportion of positive family history of coronary heart disease in minority youth group was significantly higher than in the older group and Han youth group. This is consistent with previous findings [19]: The occurrence time of time in people who have a family history of coronary heart disease was 10 years earlier than people with negative family history, which suggested that genetic factors occupy a certain position in the development of acute myocardial infarction and there may be genetic difference between different ethnic groups.

In terms of ethnic differences, the study found that, among the Xinjiang region, Han, Uygur and Kazak AMI patients, the difference exist in BMI, lipid levels, positive family history of coronary heart disease, hypertension, and type 2 diabetes. These differences may be caused by: First, as mentioned above, different ethnic groups have different lifestyles, eating habits, geographical and cultural differences and other extrinsic factors. Secondly, acute myocardial infarction is multiple factor disease. In addition to the risk factors, the differences existed in gene in different ethnic. External and internal

synergy led to the development of the disease. Finally, due to the different economic development of inhabited areas, lower degree of disease awareness in minority, insufficient attention to health, poor medication compliance and other phenomena can also cause these differences.

In terms of coronary artery disease, many studies [20, 21] have shown that single-vessel disease was the main characteristic of coronary lesions in the young. Before involved vessels, descending branch was most common. Multi-vessel disease is more common in the elder and the lesions were correlated with age. The results of the study showed that, compared with the older group, single-vessel disease rate is higher in minority youth group, double-vessel disease and three were lower than the older group. This study was basically consistent with the Han population. The reasons maybe that elasticity of blood vessels and endothelial function was well in young patients. The extent of coronary atherosclerosis was low and combined with less hypertension, diabetes and so on. The proportion of zero coronary lesions in minority youth group was higher than that in the older group. The reason may be that a small part of young patients with myocardial infarction due to the sudden sharp spasm of coronary artery occlusion partial short or intravascular thrombus autolyzed and caused recanalization. While elder patients with myocardial infarction had serious coronary atherosclerosis, and the function of vascular endothelial weakened. Therefore, the chance of thrombosis autolysis is low. These findings indicated that the subsequent clinical treatment of patients with zero lesions should primarily focus on anticoagulant, antiplatelet, relieving coronary spasm and the prevention of risk factors. In terms of ethnic differences, this study showed that the Gensini scores in Uygur and Kazak patients were less than that in Chinese Han patients. The proportion of patients with single-vessel disease in Uygur was less than that in Kazak and the proportion of double vessel disease was higher than that in Kazak. The result [5-7] was inconsistent with the previous findings. Possibly, this may be associated with the traditional diet of the minority, timely medical treatment after myocardial infarction, diseases publicity and education efforts, and many factors related to medication compli-

ance. For example, in the Uygur traditional diet, onions, carrots, nuts, etc played a protective role in cardiovascular.

The results of this study indicated that differences may help identify high-risk groups of AMI, prevent the disease as early as possible, thereby reduced the incidence of acute cardiovascular events.

Disclosure of conflict of interest

None.

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