

## Research article

### Assessment of cardiovascular risk in Kyrgyz Republic

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#### Abstract

**Objective:** An analysis of the current situation in the Kyrgyz Republic demonstrates that the areas of concern in care system for patients with cardiovascular diseases (CVD) are the insufficient and untimely identification of cardiovascular risk factors, as well as their ineffective management due to the incomplete implementation of existing risk stratification guidelines and decision-making. This study assesses distribution of total cardiovascular risk among the population of the Kyrgyz Republic using the WHO/ISH risk scale. In addition, the distribution of the main risk factors separately is calculated, as well as the frequency of some additional CVD risk factors that are not included into the WHO/ISH evaluation scale is estimated.

**Methods:** This research was carried out within the framework of the international project "STEPS". The survey used a questionnaire developed by WHO and adapted to the Kyrgyz Republic. Overall, 2417 people were selected at the age of 25 to 65 years, of which 59.0% are women and 41.0% are men. The mean age in general was 43.9 (11.5) years. Of these, mean age for men was 44.0 (11.2) years and for women - 43.8 (11.7) years ( $p>0.05$ ).

**Results:** According to the WHO / ISH chart, the proportion of low, medium, high and very high risk for age group of 40-65 years was 73.9%, 4.6% and 21.4%, respectively. According to the results of the study, among respondents aged 40 to 65 years, a high prevalence of the main risk factors for CVD was revealed (arterial hypertension - 61.5%, hypercholesterolemia - 31.6%, smoking - 19.0%, diabetes mellitus 11.1%) and other additional risk factors for CVD (insufficient intake of fruits and vegetables - 75.4%, obesity - 36.5%, physical inactivity - 29.3% and excessive salt intake - 14.0%).

**Conclusion:** Thus, very high-risk of CVD in our population was presented in 21.4% of individuals, while low risk prevailed – 73.9%. The most frequent risk factors were arterial hypertension, hypercholesterolemia, obesity and physical inactivity, insufficient consumption of fruit and vegetables followed by smoking, diabetes and excessive salt consumption.

**Key words:** cardiovascular diseases, cardiovascular risk, the WHO/ISH risk scale, risk factors, hypertension, obesity, smoking, diabetes

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#### Introduction

Cardiovascular diseases (CVD), mainly the coronary heart disease and the stroke constitute almost half of all deaths due to non-communicable diseases; they are one of the leading causes of death in low- and middle-income countries today. Almost 60% deaths due to CVD occur in people under the age of 60 in low- and middle-income countries, compared with 20% deaths in high-income countries (1, 2).

In the Kyrgyz Republic, as in many countries of the world, CVD are the main cause of death of the population and takes leading place in the structure of total mortality of the population of the Kyrgyz

Republic, and accounting for more than half (50.8%) of all deaths (3, 4).

Several studies conducted in different countries have shown that primary prevention, i.e. the elimination of risk factors (RF) of CVD has a greater effect on the mortality level than the treatment of already developed CVD. As a result of primary correction including decrease of total cholesterol, systolic blood pressure and non-smoking, mortality of CVD level in some countries decreased up to 42-60 %. While as a result of the medical treatment of CVD, including secondary prevention, the mortality levels decreased only to 23- 47% (5-10).

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Since the publication of the first risk score from the Framingham Heart Study in 1976 (11), many other scales have been developed and used in other studies (12-17). The World Health Organization and the International Society for Hypertension (WHO/ISH) have developed regional prognostic scales based on fewer risk factors. These scales are intended for doctors and other health professionals of primary-level health for the prevention of CVD in each of the fourteen WHO subregions (18).

An analysis of the current situation in the Kyrgyz Republic demonstrates that the areas of concern in care system for patients with cardiovascular diseases (CVD) are the insufficient and untimely identification of cardiovascular risk factors, as well as their ineffective management due to the incomplete implementation of existing risk stratification guidelines and decision-making.

This study assesses distribution of total cardiovascular risk among the population of the Kyrgyz Republic using the WHO/ISH risk scale. In addition, the distribution of the main risk factors separately is calculated, as well as the frequency of some additional CVD risk factors that are not included into the WHO/ISH evaluation scale is estimated.

## Methods

### *Study design and population*

We used the data from the regional survey study "STEPS" conducted in the Kyrgyz Republic in 2013 (19). Overall, 2417 people were selected at the age of 25 to 65, of which 59.0% are women and 41.0% are men.

### *Study variables*

The main risk factors, in addition to age and sex, as arterial hypertension, smoking, hypercholesterolemia, diabetes mellitus were assessed.

One of practical notes in the WHO management is that the CVD risk can be higher, than it is in scale: for example, at those conditions as a premature menopause, obesity, low physical activity, social and economic problems, heredity, etc. We have calculated some additional risk factors, which may therefore increase the overall risk than shown in the WHO/ISH scale (18). They are excessive salt consumption (ESC),

low physical activity, low vegetable and fruit consumption (LVFC) and obesity.

The following criteria were used to determine risk factors:

-Blood pressure was measured three times, with an interval of five minutes, and the final result was taken as the arithmetic mean between the last two indicators. Criteria for diagnosis of arterial hypertension were: systolic blood pressure  $\geq 140$  mm Hg. and/or diastolic blood pressure  $\geq 90$  mm Hg as well as the fact of regular intake of antihypertensive agents.

-Smoking as a risk factor was considered in the case of smoking of at least one cigarette during the day or those who quitted smoking less than 1 year ago.

-The presence of hypercholesterolemia was recognized at the level of total blood cholesterol  $> 5.0$  mmol/l.

-The criteria for diabetes mellitus were the level of glucose in the capillary blood  $\geq 6.1$  mmol/l or a confirmed history of diabetes mellitus.

-Obesity was recognized in the presence of a body mass index of  $\geq 30$  kg/m<sup>2</sup>.

-Excessive salt intake was often (or always) the addition of salt to food immediately before or during meals, as well as the frequent use of foods with a high salt content (for example, smoked meats, sausages, canned food, salted foods and national beverages, etc.).

-Low physical activity was recognized when sitting or reclining for at least 5 hours on a typical day with no active leisure (walking or exercising for at least 30 minutes a day at least 5 times a week).

-The consumption of vegetables and fruits was considered insufficient when taking less than five servings of vegetables and / or fruits per day.

The CVD total risk was calculated using the WHO/ISH risk scale (18) for the European subregion B, which includes the Kyrgyz Republic, based on age, gender, systolic blood pressure, smoking status, total cholesterol, and the presence or absence of diabetes (previously diagnosed or fasting capillary blood glucose  $> 6.1$  mmol/l). The 10-year overall risk of fatal or non-fatal cardiovascular disease was classified as "low risk" if the risk was less 10%, "moderate risk" if the risk was 10-19%, "high risk" if the risk was 20-29%, and finally "very high risk" if the overall risk was  $\geq 30\%$  (16).

### Statistical analysis

SPSS software version 23 (IBM, USA) was used for statistical analysis. Proportions and 95% confidence intervals (95% CI) were calculated for each group. Chi-square test was used for proportional differences for independent variables. The significance level was established at  $p < 0.05$ .

### Results and discussion

#### Distribution of individual risk factors

Table 1 shows the distribution of the main CVD risk factors in the study groups divided by sex and age (40-49 years, 50-59 years and 60-64 years). According to the table, arterial hypertension is the first most common risk factor, representing 61.5% in the general age category of 40-64 years, having small sex differences (men - 59.8%, women- 62.5%, NS) with a tendency to increase as the age grows. Hypercholesterolemia ranked second with an overall rate of 31.6%, it is much higher among women than men (35.4% vs. 25.1%,  $p < 0.001$ ). Diabetes mellitus is also more common among women in the general age group (40-64) - 12.4% vs. 8.7% in man,  $p = 0.02$ .

At the same time, hypercholesterolemia and diabetes mellitus are more common in men at the age of 50-59

years, and in women - at the age of 60-64 years. The frequency of main factors increases with age, except of smoking. The smoking at the age 60-65 years decreases by half compared to the category 50-59 years (22.0% against 10.9%,  $p < 0.001$ ). Smoking rates are significantly higher in men at all age groups compared to women. Smoking is one of the three major risk factors, taking the third place in the prevalence among the main risk factors in the general age group and making 19.0% (men - 46.6%, women - 2.9%,  $p < 0.001$ ).

Thus, Kyrgyzstan has a high prevalence of the main CVD risk factors, especially arterial hypertension, hypercholesterolemia, smoking, which contribute to the CVD mortality. These results require urgent action to deal primarily with these risk factors, using different prevention strategies.

In addition to the main CVD risk factors, there are additional risk factors that have been shown to receive little attention. It has been shown that there is a fairly high prevalence of risk factors such as obesity (36.5%), low physical activity (29.3%), ECS (14.0%), only 25.1% of respondents eat the recommended amount of fruits and vegetables per day.

**Table 1. The prevalence of major risk factors in men and women aged 40 to 65 years**

Risk factors	Men				Women				Total			
	40-49	50-59	60-64	40-64	40-49	50-59	60-64	40-64	40-49	50-59	60-64	40-64
Arterial hypertension, % (95% CI)	52.7 (46.5-58.8)	63.3 (57.4-69.5)	70.9 (61.6-80.7)	59.8 (55.4-63.8)	50.2 (45.0-54.6)	67.6 (63.0-71.9)	79.9 (73.9-85.6)	62.5 (59.6-65.5)	51.2 (47.1-54.8)	65.9 (62.3-69.4)	77.1 (72.0-82.4)	61.5 (59.1-63.9)
Smoking, % (95% CI)	48.1 (42.3-54.4)	49.4 (43.2-55.3)	33.7 (24.0-43.5)	46.6 (42.5-50.5)	2.3 (1.0-3.9)	4.8 (2.7-6.8)	0.5 (0.0-1.8)	2.9 (1.9-4.1)	19.5 (16.7-22.4)	22.0 (19.0-25.2)	10.9 (7.4-14.7)	19.0 (17.2-20.9)
Hypercholesterolemia, % (95% CI)	20.0 (15.2-24.9)	30.7 (25.2-36.4)	24.4 (15.5-33.3)	25.1 (21.7-28.8)	27.0 (23.0-31.4)	41.0 (36.2-45.9)	42.9 (35.7-50.0)	35.4 (32.4-38.3)	24.4 (21.3-27.7)	37.0 (33.4-40.8)	37.1 (31.5-42.9)	31.6 (29.2-33.9)
Diabetes mellitus, % (95% CI)	5.4 (2.9-8.1)	10.8 (7.0-15.1)	5.4 (2.9-8.1)	8.7 (6.5-11.0)	8.1 (5.5-10.9)	13.3 (10.1-16.6)	20.6 (15.2-26.6)	12.4 (10.3-14.5)	7.1 (5.0-9.1)	12.3 (9.8-15.0)	18.2 (13.9-22.8)	11.1 (9.6-12.5)

\*-  $p < 0.05$ ; \*\*-  $p < 0.01$ ; \*\*\*-  $p < 0.001$  for men-women comparison

The Table 2 shows that there are no major differences in excess salt consumption and low physical activity between men and women. The obesity is common in women than in men (41.9% versus 27.3,  $p < 0.001$ ), a difference persists in all age groups. At the same time, low consumption of vegetables and fruits is more

common in men – 81.2% compared to 71.8 % in women,  $p = 0.004$ ).

Thus, in Kyrgyzstan there is a high prevalence of additional risk factors of CVD too, which also requires a big attention from medical personnel and measures to correct them.

Risk factors	Men				Women				Total			
	40-49	50-59	60-64	40-64	40-49	50-59	60-64	40-64	40-49	50-59	60-64	40-64
ECS, % (95% CI)	15.0 (10.8-19.2)	13.9 (9.7-18.5)	4.7 (1.0-9.6)	13.1 (10.6-15.8)	15.5 (12.2-19.0)	14.4 (10.7-17.7)	12.7 (8.2-17.5)	14.5 (12.4-16.6)	15.3 (12.7-17.9)	14.2 (11.5-17.1)	10.2 (6.9-13.7)	14.0 (12.3-15.7)
Hypodynamia, % (95% CI)	24.2 (19.0-30.2)	28.7 (23.5-34.1)	27.9 (18.6-36.9)	26.6 (23.0-30.3)	30.9 (26.7-35.6)	28.7 (24.4-33.3)	34.9 (28.2-41.8)	30.8 (27.9-33.8)	28.4 (24.9-31.8)	28.7 (25.2-32.1)	32.7 (27.2-38.6)	29.3 (26.9-31.5)
Obesity, % (95% CI)	25.0 (19.9-30.7)	27.1 (21.7-32.4)	34.9 (24.5-44.9)	27.3 (23.8-30.8)	36.7 (32.0-41.5)	41.6 (36.6-46.4)	54.5 (47.4-62.0)	41.9 (38.8-45.0)	32.3 (28.8-35.9)	36.0 (32.0-39.5)	48.4 (42.7-54.2)	36.5 (34.1-38.8)
LVFC, % (95% CI)	81.6 (76.6-86.3)	80.9 (75.3-85.7)	80.3 (70.9-88.5)	81.2 (77.3-85.0)	72.6 (68.4-76.8)	72.7 (68.3-77.3)	69.7 (62.9-76.1)	71.8 (68.9-74.7)	75.7 (73.2-78.2)	75.5 (72.9-78.1)	73.3 (70.4-76.2)	75.4 (73.0-77.9)

\*- p<0.05; \*\*- p<0.01; \*\*\*- p<0.001 for men-women comparison  
ECS - excessive consumption of salt, LVFC - low vegetable and fruit consumption

*The distribution of the overall CVD risk on the WHO/ISH scale (Table 3)*

Although previous data showed a high prevalence of CVD risk factors in the study population. The vast majority of subjects (73.9%) have a 10-year CVD risk of low risk (CVD risk <10%), 4.6% of subjects have a moderate risk (CVD risk from 10% to 20%). The total proportion of subjects with high (CVD risk from 20% to 30%) and very high (CVD risk > 30%) CVD, including those with CVD, was 21.4%, it was higher for women (22.9% versus 18.9% in men, NS p= 0.06 ). The proportion of subjects with a high 10 - year risk of CVD increased significantly with increasing age (14.1%, 24.3%, and 34.0% in 40-49 years, 50-59 years, and 60-65 years, respectively, p<0.001). There is also a predominance of CVD risk in men than women in the 40-49 age group (15.7 % and 13.3%, respectively). In the other age groups, it was significantly more prevalent in women than in men, that is, in 50-59 years (28.1 % and 18.3%, respectively) and 60-65 years (34.8% and 30.9%, respectively). In the category of persons at moderate 10-year risk, there was also a pattern of increase with age without any significant differences between men and women.

A comparative analysis by age categories showed that in 40-49 years group, the 10-year risk of CVD

prevailed in women than men (33.2% and 1.9%, respectively), in the age group of 50-59 years, on the contrary, more prevailed in men than women (6.4% and 3.3%, respectively). In the age group of 60-65 years, there were no significant differences in moderate risk between men and women. The overall proportion of people at low risk (CVD risk < 10%) decreased naturally as the age group increased (83.2%, 71.4%, and 56.0%, respectively) with a predominance of men (76.4%) than women (72.5%). Thus, 73.9% of respondents refer to low risk, 21.4% - high and very high risk, 4.6% - moderate risk. The high 10-year risk of CVD increased significantly with age (40-49 years, 50-59 years and 60-65 years) and prevailed in men in 40-49 years, in the other age groups (50-59 years and 60-65 years) significantly more in women. In the moderate-risk category, there was also an increase in the 10-year risk of CVD with age without any significant differences between men and women. In 40-49 years group, the risk prevailed in women than in men, in 50-59 years group, on the contrary, it significantly prevailed in men than in women, and in 60-65 years, there were no significant differences between men and women. The overall proportion of low-risk individuals naturally decreased more in men with increasing age.

**Table 3. The prevalence of total 10-year risk of cardiovascular disease on WHO/ISH scale**

Risk level	Men				Women				Total			
	40-49	50-59	60-64	40-64	40-49	50-59	60-64	40-64	40-49	50-59	60-64	40-64
<b>low risk (&lt;10%)</b>	82.4 (77.3-86.5)	75.3 (69.6-80.2)	59.3 (48.4-69.3)	76.4 (72.8-79.6)	83.5 (79.7-86.7)	68.7 (64.0-73.0)	54.5 (47.2-61.6)	88.7 (86.7-90.3)	83.2 (80.2-85.8)	71.4 (67.8-74.7)	56.0 (49.9-61.9)	73.9 (71.7-76.0)
<b>moderate risk (10-19 %)</b>	1.9 (0.7-4.5)	6.4 (3.9-10.2)	9.9 (4.9-18.5)	4.7 (3.3-6.8)	3.2 (1.9-5.4)	3.3 (1.9-5.6)	10.7 (6.9-16.1)	4.6 (3.4-6.0)	2.7 (1.7-4.3)	4.3 (3.0-6.2)	10.4 (7.2-14.8)	4.6 (3.7-5.8)
<b>high risk (20% . &gt;)</b>	15.7 (11.8-20.6)	18.3 (14.0-23.6)	30.9 (21.8-41.6)	18.9 (15.6-22.2)	13.3 (10.4-16.9)	28.1 (23.9-32.7)	34.8 (28.2-42.1)	22.9 (20.4-25.6)	14.1 (11.7-16.9)	24.3 (21.2-27.8)	34.0 (28.5-40.0)	21.4 (19.5-23.5)

**Limitations of the study:** This is a cross-sectional survey study; further longitudinal prospective studies are required.

### Conclusion

Thus, very high-risk of CVD in our population was presented in 21.4% of individuals, while low risk prevailed – 73.9%. The most frequent risk factors were arterial hypertension, hypercholesterolemia, obesity and physical inactivity, insufficient consumption of fruit and vegetables followed by smoking, diabetes and excessive salt consumption. Predictive CVD risk assessment scales are extremely important tools for reducing morbidity and mortality. These scales for calculating the total risk of cardiovascular disease in a patient help to identify subgroups with an increased or high-risk of cardiovascular disease for subsequent active primary prevention. However, the overall risk of CVD may be underestimated because additional risk factors are not considered. Consequently, additional risk factors need to be assessed and adjusted in low- to moderate-risk individuals. While the CVD Risk scales are intended to be used by clinicians to quickly and consistently assess the overall CVD risk at an individual level, they can also be used to assess and monitor the distribution of CVD risk in a population in a population-based study.

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