

Prevalence of traditional cardiovascular risk factors in high-risk Kyrgyzstan population as compared to Indians – An Indo-Kyrgyz cardiometabolic study

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ABSTRACT

Background: Cardiovascular diseases (CVDs) are one of the most prevalent causes of mortality worldwide, especially significant in low- and middle-income countries. Kyrgyzstan and India represent such nations that face a huge burden of CVD-related deaths globally. Understanding the prevalence of traditional cardiovascular risk factors (CVRFs) in these populations is critical for effective prevention and management strategies. **Methods:** This is a multicentric, observational study where we compared the prevalence of CVRFs in high-risk populations from Kyrgyzstan and India. Data was collected from established ASCVD patients attending cardio-metabolic clinics at tertiary care centers between December 2021 and December 2023. Demographic characteristics and CVRFs, which encompassed diabetes, hypertension, lipid profile parameters, tobacco consumption, etc., were assessed. Statistical analysis was performed to identify significant differences between the cohorts. **Results:** A total of 1552 individuals (772 from Kyrgyzstan, 750 from India) were studied. The Kyrgyzstan cohort had a significantly higher mean age and a greater proportion of females compared to the Indian cohort. The prevalence of tobacco consumption, hypertension, and diabetes was significantly higher in Kyrgyzstan than in India. Lipid profile analysis revealed greater level of LDL, HDL, and total cholesterol in the Kyrgyzstan cohort. Conversely, triglyceride levels were lower in Kyrgyz individuals. The Kyrgyzstan cohort also demonstrated better left ventricular systolic function compared to the Indian cohort. **Discussion:** Our study highlights significant differences in the prevalence of traditional CVRFs between high-risk populations in Kyrgyzstan and India. Higher rates of tobacco consumption, hypertension, and diabetes in Kyrgyzstan signify the immediate need for targeted interventions to address these modifiable risk factors. Targeted public health programs focusing on these lifestyle modifications and efficacious management of CVRFs are crucial to reduce the burden of cardiovascular deaths in both countries.

Keywords: Atherosclerotic cardiovascular disease, cardiovascular diseases, cardiovascular risk factors, India, Kyrgyzstan

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Introduction

Cardiovascular diseases (CVDs) are the leading cause of death globally and account for nearly half of all deaths from non-communicable diseases. About 85% of these deaths are due to coronary artery diseases and stroke. Of all deaths due to CVDs, over three-quarters were reported from low- and middle-income countries. During the period 2008-2017, low- and middle-income countries accounted for 59.5% and 57.1% of global CVD disability-adjusted life-year losses and death rates, respectively.^[1] This is likely due to lower availability and access to equitable resources for early detection and treatment. An estimated 17.9 million deaths due to cardiovascular diseases (CVDs) were reported globally in 2021. Most cardiovascular diseases can be prevented by addressing behavioral risk factors such as tobacco use, unhealthy diet and obesity, physical inactivity, and harmful use of alcohol. Hence, it is important to detect cardiovascular risk factors apart from disease as early as possible so that management with counseling and medicines can begin.^[2]

In the Kyrgyz Republic, as in many countries of the world, cardiovascular diseases are the primary cause of deaths leading to more than half (50.8%) of total deaths.^[3-5] More than eighteen thousand people in Kyrgyzstan die from CVD each year averaging 50 deaths per day. The primary cause of CVD-related death is coronary heart disease (80% of all CVD mortality, including acute myocardial infarction), followed by cerebrovascular diseases.^[4] In Kyrgyzstan, studies on the prevalence of Cardiovascular risk factors (CV RF) were mainly conducted during the Soviet Union era.^[6,7] However, since then, the socio-economic way of life has changed significantly. Therefore, there remains a need to update the statistics on the prevalence of CV RFs in the Kyrgyz Republic.^[5]

India, like Kyrgyzstan, falls into the lower-middle income country category but stands higher on the socio-economic and developmental scale. However, India's Human Development Index (HDI) is lower at 0.63 compared to Kyrgyzstan's 0.69.^[8] India has one of the highest burdens of cardiovascular disease (CVD) worldwide. The annual number of deaths from CVD in India is projected to rise from 2.26 million (1990) to 4.77 million (2020).^[9] Global death counts due to CVD increased from 12.4 million in 1990 to 19.8 million in 2022.^[10] The results of the Global Burden of Disease study state an age-standardised CVD death rate of 272 per one lakh population in India, which is much higher than the global average of 235 deaths per one lakh population in 2023.^[11] The analysis of the current situation in the Kyrgyz Republic shows that in the treatment system of patients with cardiovascular diseases, there is insufficient and premature identification of risk factors for CVDs and their ineffective management, which is due to the insufficient implementation of health protection measures, low screening rates, and high prevalence of risk factors. Risk factors are classified into two types: modifiable and non-modifiable. Modifiable cardiovascular risk factors include hypertension, high cholesterol, tobacco consumption, diabetes, obesity, and inactivity. Nonmodifiable risk factors are age, gender, family history, and ethnicity.

This study assesses the prevalence of different risk factors for cardiovascular diseases in a population of the Kyrgyz Republic and compared to a population of India. We conducted this multicentric, observational study at three tertiary care centers' cardiometabolic clinics (1 in Kyrgyzstan and 2 in India). All consecutive patients with established ASCVD (atherosclerotic cardiovascular disease) from the outpatient department of these clinics between December 2021 to December 2023 were included in the study. Understanding the differences in risk factors between the two developing countries can provide insights into the broader global burden of CVDs and help tailor interventions and policies to the specific needs of different regions. By comparing risk factors, health resources can be more efficiently allocated to address each country's most pressing problems and optimize health delivery and outcomes. Identification of common risk factor (hypertension, high cholesterol, tobacco consumption, diabetes, obesity, and sedentary lifestyle). and novel risk factors (inflammatory disorders, chronic kidney disease, sleep apnea, and environmental pollutants) in India and Kyrgyzstan can inform public health policies and interventions aimed at reducing CVD prevalence and associated morbidity and mortality.

Method

This cross-sectional study sought to conduct a comparative analysis aimed at revealing significant differences in the prevalence of cardiovascular risk factors between the high-risk populations of India and Kyrgyzstan. This was multicentric, observational study conducted at three tertiary care centers' cardiometabolic clinics in both countries. Participants were consecutive patients of established ASCVD (atherosclerotic cardiovascular disease) at all three centers from the outpatient department of cardiometabolic/diabetology clinics between December 2021 and December 2023 who came for their consultation. Apart from patient demographics, the patients' data were collected for conventional risk factors for cardiovascular diseases and comparative analysis was done to seek the prevalence of major traditional risk factors of CAD in these cohorts. Ethical clearance was obtained from an independent ethics committee.

Traditional cardiovascular risk factors (CVRF) were defined as per the INTERHEART study while ASCVD was defined as per ACC definition.^[12,13]

A total of 1552 individuals were recruited based on incidence of acute coronary syndrome (ACS) for the analysis of which, 772 individuals were from Kyrgyzstan and 750 individuals were from India. Before data collection, informed consent was obtained, and Good Clinical Practices (GCP) guidelines were followed.

Demographic characteristics and cardiovascular risk factors were evaluated for variables including age, sex, tobacco consumption, hypertension, and diabetes, as well as lipid profile parameters, such as total cholesterol (TC), low-density lipoprotein (LDL), triglycerides (TGS), and high-density lipoprotein (HDL).

Overnight fasting lipid profile was measured using Siemens/Mindray, Dimension Xpand EXL machine. Total cholesterol, triglycerides, and HDL were directly measured, while LDL was given indirectly through calculations by the machine. Clinical evaluation included pulse, systolic and diastolic blood pressure, and left ventricular ejection fraction (LVEF) as assessed by 2D transthoracic echocardiography. Blood pressure was measured in the right brachial artery in sitting position after at least 15 minutes of resting in all three centers.

Data analysis was performed using Statistical Package for Social Science (SPSS) version 25 software. Descriptive statistics such as mean and standard deviation for continuous variables, alongside frequencies and percentages for categorical variables were calculated. Moreover, the prevalence of cardiovascular risk factors and their correlations with demographic variables were analyzed through the application of appropriate statistical tests (*t*-test and Chi-square). A *P* value of less than 0.05 was considered statistically significant.

Result

Demographic characteristics

Of 1522 participants, 772 were from Kyrgyzstan and 750 from India were included in this study. Individuals from Kyrgyzstan have a significantly higher mean age (65.70 ± 9.8 years) compared to Indian individuals (57.87 ± 7.9 years) ($P = 0.0001$). The population included in this study showed a significant difference in the distribution of gender. Kyrgyz population was predominantly female (77%), whereas the Indian population mainly constituted males (66%).

Cardiovascular risk factors

The prevalence of tobacco consumption was significantly higher in the Kyrgyzstan cohort (52.9%) compared to the Indian cohort (21%) ($P = 0.00001$). Hypertension was found to be markedly higher in the Kyrgyzstan cohort among patients with established ASCVD in cardiometabolic clinic (82.6%) as compared to the Indian cohort (56.4%). The study also showed a high prevalence of diabetes in established ASCVD patients in the tertiary care cardiometabolic clinic of Kyrgyzstan (80.2%) as compared to India (53.2%) ($P = 0.00001$).

Lipid profile analysis in participants from Kyrgyzstan showed both total cholesterol (TC) and Low-density lipoproteins (LDL) levels significantly higher with a mean of 187.55 ± 46.4 mg/dL and 102.86 ± 38.28 mg/dL, respectively, compared to India which had a mean of 171.2 ± 55.8 mg/dL and 81.8 ± 21.7 mg/dL, respectively.

HDL levels were significantly higher among Kyrgyz individuals than in Indian individuals ($P = 0.0001$). The difference in triglyceride levels between the two populations is statistically significant ($P = 0.0059$), with the Kyrgyz cohort having lower levels than the Indian cohort with ASCVD.

The population in Kyrgyzstan demonstrated better LV systolic function, as indicated by a mean ejection fraction (EF) of $60 \pm 22.02\%$, compared to the population in India, which showed a mean EF of $47.6 \pm 19.2\%$ ($P = 0.0001$).

A comparison of the prevalence of traditional CV risk factors between the Kyrgyz and Indian populations is summarised in Table 1.

Discussion

Our study compares the risk factors for cardiovascular diseases (CVDs) in the populations of Kyrgyzstan and India. Since there are not many comparison studies, our research will help determine possible causes for these variations and provide methods for enhancing cardiovascular health behaviors as well as frame policies to support them. In this study, Kyrgyzstan emerges with a markedly heightened prevalence of tobacco consumption, hypertension, diabetes mellitus, and elevated levels of bad cholesterol compared to India.

A discernible contrast exists in the age composition, with the Kyrgyzstan cohort demonstrating a higher mean age compared to the Indian cohort by almost 8 years concurrent with previous studies among Indians.^[14] This demographic divergence holds significant implications for cardiovascular risk profiles given the well-established association between age and such risk factors.^[15] A substantial rise in the prevalence of CVD is noted among older adults which may be due to physical inactivity.^[16] Kyrgyzstan group has a significant female predominance whereas most of the participants in India were males, thus leading to variable distribution of risk factors.^[17] In most age groups, males have greater age-specific rates of cardiovascular disease (CVD) than women do, but the overall lifetime risk of CVD is comparable

Table 1: Analysis of Indo-Kyrgyzstan cardiovascular risk factors

Variable	Kyrgyz 772, n (%)	India 750, n (%)	P*
Age (years)	65.70±11.18	57.87±10.9	0.0001
Sex			
Male	181 (23.4)	496 (66.1)	0.00001
Female	591 (76.6)	254 (33.9)	0.00001
Females <25 years	0	0	
Females 25–50 years	87 (14.7)	35 (13.8)	NS
Females >50 years	504 (85.3)	219 (86.2)	NS
Tobacco consumption prevalence	409 (52.9)	157 (21)	0.00001
Hypertension	638 (82.6)	423 (56.4)	0.00001
Diabetes	619 (80.2)	399 (53.2)	0.00001
BP systolic (mmHg)	166.23±30.75	135.5±21.9	0.0001
BP diastolic (mmHg)	97.62±16.24	81.8±9.8	0.0001
LVEF (%)	60±22.02	47.6±19.2	0.0001
TC (mg%)	187.55±46.4	171.2±55.8	0.0001
LDL (mg%)	102.86±38.28	81.8±21.7	0.0001
Triglycerides (mg%)	152.35±100.97	166.5±99.2	0.0059
HDL (mg%)	49.88±15.85	39.29±12.3	0.0001

* $P < 0.05$ is considered significant. NS=Not significant with $P > 0.05$

for both sexes. Moreover, research indicates that rates of CVD vary not just between genders but also between age groups and racial subgroups within the same sex.^[18]

The Kyrgyzstan cohort had a markedly higher prevalence of tobacco consumption (52%) compared to the Indian cohort (21%), portending an augmented burden of cardiovascular risk factors in the Kyrgyzstan cohort in comparison to the Indian cohort. Earlier epidemiological studies performed in Kyrgyzstan also highlighted tobacco consumption as an increasing risk factor and prevalence was comparable with our study.^[5] In the 1980s, over half of men smoked, with rates declining with age. Previous studies data showed that by the early 2000s, tobacco consumption was prevalent among 50.1% of rural Kyrgyzstan men and 0.5% of women.^[19,20] Moreover, a study by Polupanov G. reported that the prevalence of tobacco consumption among women was noted to be significantly high and reached 8.0%.^[5]

Kyrgyzstan cohort from the cardiometabolic clinic showed a notably higher prevalence of hypertension (82.6%) in comparison to India (56.4%), characterized by a considerable proportion exceeding the systolic blood pressure threshold of 120 mm Hg, suggesting multifactorial determinants encompassing lifestyle, dietary habits, and genetic predispositions. These high numbers of both hypertension and diabetes mellitus II in both the cohorts reflects a selection bias as both cohorts were from the cardiometabolic clinics of tertiary care centers. The discernibly elevated mean systolic and diastolic blood pressure values in Kyrgyzstan underscore probably a heightened burden of hypertension relative to India or may reflect higher utilization of tertiary care facility by these high-risk individuals as compared to Indian cohort. Early epidemiological investigations in Kyrgyzstan revealed hypertension rates of 15.2% in lowland residents and 3.44% in mountain inhabitants.^[21] By the late 20th century, urban hypertension prevalence ranged from 25% to 28.1%. Subsequently, at the start of the 21st century, urban rates surged to 41%, while rural areas saw an increase to 38.5%.^[22] These fluctuations may be linked to changes in Kyrgyzstan's healthcare system following the collapse of the Soviet Union.^[5] The Kyrgyz population consumes high salt diet, which adds to their higher prevalence of hypertension.

The high prevalence of diabetes in the Kyrgyzstan population is a major risk factor for cardiovascular diseases. Our study shows high prevalence of diabetes mellitus in Kyrgyzstan (80.2%) in comparison to India (53.2%) among high CV risk/ASCVD patients in patients of cardiometabolic clinics in tertiary care centers of these countries. A close link exists between DM and cardiovascular disease and many studies have found biological mechanisms associated with DM that independently increase the risk of CVD in diabetic patients.^[23] Kyrgyzstan is a lower-middle-income country with a much lower GDP per capita than India. Lower economic status has been linked with increased diabetes rates due to restricted access to healthcare, education, and good nutrition choices. The prevalence of diabetes in Kyrgyzstan is a growing concern, with estimates indicating a

5.0% prevalence of diabetes in the population aged 20-79 years, expected to increase to 6.6% by 2035.^[24] The unusually high prevalence in these study cohorts reflects the selection bias of cardiometabolic clinics at tertiary care centers in both countries.

The Kyrgyzstan cohort presented with a higher mean Left ventricular ejection fraction (LVEF%), suggestive of better cardiac function when compared to their Indian counterparts (60 ± 22.02 as opposed to 47.6 ± 19.2).

Epidemiological research has investigated the links between lipid levels and cardiovascular diseases like stroke and coronary heart disease (CHD). Two major prospective cohort studies revealed that high levels of total cholesterol, low-density lipoprotein cholesterol, and triglycerides, along with low levels of high-density lipoprotein cholesterol, are associated with a greater risk of developing CVD.^[25,26]

In our study, the Kyrgyzstan cohort showed elevated levels of total cholesterol, triglycerides, and LDL cholesterol as notable cardiovascular risk factors. However, a higher mean HDL cholesterol level, conferring cardioprotective benefits, was also observed in Kyrgyzstan compared to the Indian cohort (49.88 ± 15.85 versus 39.29 ± 12.3). In previous studies in Kyrgyzstan, disorders of at least one of the four lipid parameters were observed in 88.4% of the subjects out of which most respondents had combined dyslipidemia.^[5]

Customized public health programs are needed to reduce the burden of cardiovascular disease in both countries. These programs should include efforts to help people achieve healthier lifestyle choices, quit tobacco consumption/tobacco consumption, and better management of modifiable cardiovascular risk factors like high blood pressure and diabetes. Additionally, more research is needed to understand why different groups of people different risks for cardiovascular disease have, so we can create region and country-specific strategies to mitigate them.

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Conflicts of interest

There are no conflicts of interest.

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