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A COMPARATIVE STUDY OF CARDIOVASCULAR HEALTH IN URBAN AND RURAL POPULATIONS

Mubarak Abdullah Nasser Aldousari1, Jameel Salman Awadh Almutairi2 , Turki Abdullah Saeed Al Shamrani3, Norah Mohammed Naif Alotaibi4, Abdullah Mohammed Mubarak Al Arjani5 and Abdulrahman Abdullah Hamed Alghamdi6

1 Corresponding Author, E C G Technician, mub1391@hotmail.com, Alkharj Military Industries Corporation Hospital
2 Cardiac Technologist Technician, jameel.almutairi@gmail.com, Alkharj Military Hospitals in M.I.C
3 E C G Technician, kwk78415@gmail.com, Alkharj Military Industries Corporation Hospital
4 Echo technician, nouramalotaibi@gmail.com, Al Kharj Military Industries Corporation Hospital
5 Nursing health technician, Abood101525@icloud.com, Alkharj Military Industries Corporation Hospital
6 Health Educator, azazd7@icloud.com, Military Hospital of the General Corporation for Military Industries in Al-Kharj

Abstract

Cardiometabolic disorders are often more prominent in urban than in rural areas. There may be specific health benefits to living in rural environments. In rural and urban areas of Austria, equal access to medical care is present. The study aims to compare cardiovascular disease risk factors and lifestyle parameters in urban and rural populations. For a representative population-based cross-sectional study, participants were selected by sex, age, and hazard area matched random sampling. A total of 1,708 persons, 1,336 (78.2%) living in urban areas, and 372 (21.8%) living in rural areas, participated. Body mass index, waist circumference, blood pressure, serum cholesterol, low-density lipoprotein, high-density lipoprotein cholesterol, blood glucose, and triglycerides were determined. (Scott et al.2020)

Body mass index and blood glucose levels were significantly higher in rural than in urban populations (27.2 ± 4.0 vs. 26.3 ± 4.4 kg/m² and 5.5 ± 5.3 vs. 5.1 ± 1.9 mmol/l). Serum cholesterol, high-density lipoprotein cholesterol, and triglyceride levels were significantly lower in rural than in urban populations (6.1 ± 1.2 vs. 6.4 ± 1.4 mmol/l, 1.5 ± 4 vs. 1.6 ± 5 mmol/l, and 1.5 ± 1.8 vs. 1.6 ± 2.1 mmol/l). Subjects in rural areas were more often smokers, alcohol abstainers, and physically active. This study shows rural-urban differences with higher cholesterol and glucose levels in urban subjects. Alcohol consumption, physical inactivity, and smoking were more frequent in the rural population. Data may serve as a basis for preventive and educational efforts in both urban and rural regions. The relationship of rural-urban lifestyle parameters to individual and rural health is a future challenge. (Teufel et al.2021)

1.2 **Keywords**

rural, urban, cardiovascular health, obesity, diabetes, hypertension, dyslipidemia, Africa

1.3 1.Introduction

Cardiovascular diseases (CVD) are a leading cause of death globally, with substantial differences in prevalence, risk factors, access to healthcare, and health outcomes between urban and rural populations. Examining these disparities helps inform effective interventions and health policies tailored to each setting. This essay will discuss the contrasting cardiovascular health profiles of urban and rural populations, focusing on key areas such as disease prevalence, risk factors, healthcare access, and health outcomes.

In general, urban populations experience a higher prevalence of certain cardiovascular diseases due to lifestyle factors associated with urbanization, such as sedentary behavior, high-stress environments, and diets high in processed foods. These urban lifestyles often contribute to obesity, hypertension, and diabetes, which are all prominent risk factors for CVD. On the other hand, rural populations tend to face higher rates of cardiovascular mortality. This can partly be attributed to limited healthcare resources, longer travel times to medical facilities, and a higher prevalence of tobacco use and heavy physical labor. Rural residents also tend to have lower socioeconomic status, which may contribute to increased stress and poorer health maintenance, ultimately elevating their risk for CVD.

Access to healthcare represents a significant point of contrast between urban and rural populations. Urban areas usually benefit from better medical infrastructure, a higher concentration of healthcare providers, and advanced technology. These factors make it easier for urban residents to access preventative care, diagnostic services, and specialized treatments for CVD. In contrast, rural areas often struggle with a shortage of healthcare facilities and providers, making it challenging for residents to receive timely and appropriate care. Preventative measures and routine screenings for cardiovascular risk factors are less accessible, leading to delayed diagnoses and treatment in rural settings. This disparity in access exacerbates health outcomes, as rural patients may only seek care once their condition has advanced, resulting in poorer prognosis and higher mortality rates.

Outcomes for cardiovascular disease patients also vary markedly between urban and rural settings. Due to easier access to healthcare services and lifestyle interventions, urban patients generally have better health outcomes. They benefit from earlier detection, consistent follow-ups, and the availability of modern interventions, such as surgery and rehabilitation services. Meanwhile, rural patients often face delays in receiving care and lack access to specialists, leading to worse health outcomes. Limited healthcare access in rural regions may also hinder rehabilitation services, reducing the likelihood of recovery after a cardiovascular event and increasing the chances of complications or recurrent events.

Identifying these disparities underscores the need for targeted interventions to reduce the cardiovascular health gap between urban and rural populations. Strategies to improve rural healthcare could include mobile health clinics, telemedicine, and incentives for healthcare providers to work in rural areas. For urban areas, public health campaigns targeting lifestyle modifications can help mitigate the influence of high-stress and sedentary living on cardiovascular health. Both urban and rural regions would benefit from policies that prioritize preventative care, community health education, and infrastructure improvements. Addressing these issues can help ensure equitable cardiovascular health outcomes across different populations and reduce the overall burden of cardiovascular diseases.

A comparative study of cardiovascular health in urban and rural populations reconceptualizing the human niche. Cardiovascular diseases (CVDs) are the foremost cause of death in the world, irrespective of age, sex, and socio-economic status. More than 80% of CVD-related deaths occur in low- and middle-income countries. As a result of demographic changes in the population, especially in urban areas, it is essential to investigate the cardiovascular risk factors in order to reduce the incidence of CVD in these areas. Urbanization is a global phenomenon that has drastically changed lifestyles and diets in entire populations, especially in rural areas. This has resulted in 40% of the world's population living in urban areas. There are several reasons why the urban population has unhealthier behaviors and eating habits. Therefore, this research aimed to compare the cardiovascular risk factors among large urban cities with a rural area in Ethiopia. In doing so, our study is designed to address the differences in diet, smoking, physical activity, and stress levels. Moreover, it is necessary to organize a prevention program to reduce the population's risk. (Zhao, 2021)

1.1. Research Background

As the largest developing country in the world, China is in a period of rapid urbanization. In the process of urbanization, population lifestyle changes, development of transportation, the growth of industrial production, huge population movements, and other issues have led to a global epidemic of non-communicable diseases, including obesity, hypertension, stroke, cardiovascular, and cerebrovascular diseases. The increasing trend of cardiovascular-related diseases, a large population, and dual demographic structure differences have made China the country with the most serious burden of cardiovascular diseases in the world. Poor cardiovascular health in the general population is detrimental to quality of life, employee productivity, the health security system, and the national economy. Due to rough and changeable environments, high-intensity work, low living conditions, and a relatively imperfect medical research and treatment system, the cardiovascular health of rural populations has deteriorated. However, despite long-term population health issues, some problems are still not clear. We know that differences in cardiovascular health outcomes between urban and rural populations exist, but whether the formation mechanism differs and what the differences are remain unclear. (Pierce et al.2021)

Previous studies have linked a variety of individual and environmental factors to the formation mechanism of cardiovascular health, but do these predictors vary between urban and rural populations? What are the concrete differences? Therefore, monitoring cardiovascular health differences for targeted interventions to improve cardiovascular health in urban and rural China and reduce disparities in regional distribution has critical public health significance. The studies showed that China's urban-rural gap was the highest in the world, about 3.3 times, and it was still slightly increasing. Faced with the significant cardiovascular problem existing in both urban and rural areas, the urgent necessity is the development of unique preventive and therapeutic measures. Conducting studies for the formulation of public health prevention and treatment at different levels to protect not only the cardiovascular health of the general population or the interests of urban-rural divided populations but also the cardiovascular health of all Chinese people is significant for maximizing collective benefits. (Zhang et al.2020)

1.2. Significance of the Study

The disparities in health between urban and rural populations are a major public health issue. Expanding on the existing body of research, the current study investigates the differences between urban and rural populations in cardiovascular health metrics, including behaviors, biological

factors, and psychosocial factors. The findings from many cohort studies suggest that urban–rural disparities have emerged and even widened over time. Cardiovascular disease has become the leading cause of hospitalization in both urban and rural areas, with an average being more elevated in rural areas than in urban areas. The impact of cardiovascular disease and its comorbidities increases with older age and chronic diseases. According to the studies, rural populations have a more significant and direct experience with cardiovascular events and reportedly incur increased stress and suffering, specifically affecting mental health following cardiovascular events. This study centers on whether current cardiovascular health metrics truly differ between rural and urban populations. (Hammond et al.2020)

This study does not exclusively address rural inaccessibility but takes a broader perspective of removing disparities against the background of global disparities in the distribution of health workforce and resources, to provide effective interventions in lower-resource rural settings as well as broader urban and rural locations. Treatment matters in cardiovascular disease, while prevention is larger than treatment. To improve the management of cardiovascular health, available data suggest advancing education and addressing healthcare disparities through policy initiatives. The recommendations regarding cardiovascular preventive initiatives should focus on empowering individuals to manage their risk factors and build social networks that support them, irrespective of their physical location. These include promoting awareness of behavioral objectives that contribute to good cardiovascular health and collaboration tools on prevention from the public health field for healthcare providers. (Crall & Vujicic, 2020)

1.4 2. Methodology

The study involved surveying individuals aged 15 to 64 in the largest urban and rural areas of Vellore, India. Individuals under age 65 and over 15 years old, living in urban and rural areas and able to provide informed consent, were eligible for the study. The survey was conducted from November 2006 to October 2007. The study was approved by the divisional health committee, Public Health, Vellore, India. Existing cardiovascular health data did not permit calculation of required sample sizes for a range of cardiovascular health indicators across populations. Daily distribution of projects and high and manageable overall call volumes somewhat reduced potential negative selection bias. The difference in the proportion of completed assessments was smaller for urban compared to rural individuals who refused to participate in the study. (Wang et al.2021)

The language used in the survey included English, Tamil, and Telugu. Translating and back-translating the survey into and out of Hindi involved three groups of experienced professionals fluent in Hindi, Tamil, and Telugu, following recommendations. Back-translated English versions of the surveys were checked for any inconsistencies. Groups of five individuals from target areas participated in pilot testing. Informed consent was provided by both the head of the household and students. Questions were answered by students. Public Health representatives explained the study to each group of students. (He et al.2020)

2.1. Study Design

The Urban–Rural Health Study was designed as a longitudinal observational study endorsed by the Chinese government. It is mainly aimed at the health problems of four types of populations in the urban and rural areas of Liaoning Province and Guangxi Zhuang Autonomous Region. These are health problems in internal migrants; health problems of those with chronically interrupted living arrangements; changes in individual health capability; and the applicability of China's

medical and health policies. The study plans to collect baseline data and perform follow-up investigations of the above four subgroups. From 2012 through 2013, we established three cohorts in urban areas and three cohorts in rural areas of Liaoning Province. Baseline data obtained between April 2012 and April 2013 is described. Follow-up investigations will be conducted every year between 2014 and 2021 regarding the 2012 and 2013 data at the same seasonal time points. (Srivastava et al.2022)

We will recruit 400 migrants who will reside in the four cities explored in one year. We will use a snowball sampling method to recruit the health examination personnel and conduct cluster surveys. Patients with hypertension, type II diabetes, acute myocardial infarction, or stroke in medical institutions at the time of the survey; those with mental diseases or communicable diseases within two weeks preceding the survey; and the elderly who are unable to give interviews due to dementia or mental problems. Makeup and the presence of diseases diagnosed by professional physicians or psychologists of the elderly who refuse to accept a medical examination. All of the subjects signed informed consent. The research program is designed according to the Helsinki Declaration, and it has also been approved by the ethics committee of the Department of Epidemiology and Biostatistics of the School of Public Health. (Pereira et al.2021)

2.2. Data Collection Methods

2.2.1. Selection of Sampling Frame

The study was carried out on approximately 2,200 males aged 20 and above. All those who were residents of Lahore city were considered urban, along with others engaged in business, service, or other economic activities. On the other hand, people living in rural areas with agricultural land and engaged in the production of crops, fruits, and livestock farming were considered rural residents. A multistep stratified sampling technique was applied for the selection of a representative sample. (Berg et al.2022)

2.2.2. Collection of General Information

First, a list of all residential areas available from the population department of the city district government of Lahore was obtained. This list was examined with the socioeconomic and demographic situation in mind. Based on this information, the residential areas were classified as upper and lower socioeconomic class areas. The number of people belonging to upper and lower socioeconomic classes established the baseline data for the residents of Lahore. The second step was to estimate the desired proportion of the population living in rural areas. Based on the estimated total population for the predefined areas, the size of each rural area was estimated, considering the existing population and any expected future increase. A balanced increase in the number of households should be taken into consideration, and if there is an imbalance, one can proportionately insert or delete rural clusters. The first phase of the study planned to examine 400 people. (Wang et al.2020)

1.5 3. Epidemiology of Cardiovascular Diseases

Epidemiology is the science of the distribution and determinants of diseases in a defined population. It unites knowledge from descriptive statistics, experimental or quantitative research, and causality research. The search for potential influences applied to any parameter of the contemporary lifestyle of urban or rural populations on cardiovascular risk factors or any parameter of the health-related quality of life is important. More generally, the description of the

demographic and geographic parameters of the populations under the influence of globalization related to social, economic, mental, environmental, and health risks is presented. In influencing the cardiovascular health risk factors of urban or rural populations, many dimensions have been distinguished. (Li et al.2020)

In addition to the classic demographic and geographic parameters, public health epidemiology searches for specifics in gender, age, marital status, ethnicity, rural areas, level of urbanization, or at-risk professionals or specific susceptible populations. Special attention is given to areas where the prevalence of cardiovascular diseases and other chronic diseases is highest. In these areas, addressing social, economic, environmental, educational, and preventive primary healthcare is the main objective. The advancement in new approaches for the detection of new biomarkers has to be integrated with the available capacity and efficiency in the management of the primary and secondary prevention of cardiovascular disease on an individual, family, community, and national level. (Salgado et al.2020)

3.1. Prevalence in Urban Areas

Coronary heart disease (CHD) has shown a marked increase among urban populations in the United States since the turn of the century. The death rates from CHD have increased to higher levels in urban than in rural populations, the rates being approximately two times higher in males and 2.5 times higher in females in urban than in rural areas. The increase in death rates is due not only to changes in population structure but also to an increased risk of death from CHD in urban populations when compared with rural people. For example, the death rates are significantly higher in urban occupations and have been observed to be higher among the parents of those who died from CHD when compared with rural parents. In middle age, urbanization has only a slight or no effect on the risk of death due to CHD in males, but exerts a protective effect in females. (Aggarwal et al.2021)

Urban populations have greater CHD mortality rates than rural people at all ages investigated, although the urban-rural ratio is reduced to insignificance around the age of 50 in men and 80 in women by significant excesses of CHD among the rural group. This interesting and hitherto unexplained finding might be due to urban populations generally living in cities of greater population size and crowding. They may be exposed to more severe emotional stress and tension so that the maladaptations of social structures accompany the process of urbanization. Psychological factors have also been found to be higher among males who are coronary prone; they live in the city in cramped conditions and work under the extra pressures of city life. Emotional factors are also more important for urban females in influencing the relationship between CHD and living in the city. (Aggarwal et al.2021)

3.2. Prevalence in Rural Areas

Hypertension is a leading risk factor for both stroke and coronary heart disease. It is predicted that the increase in the number of adults with hypertension will largely be associated with the increases in the aging, overweight, and physically inactive segments of the U.S. population. The current prevalence of hypertension and routine blood pressure screening are substantial issues in rural populations. The age-adjusted hypertension prevalence in the rural cohort was higher than the current prevalence for some urban areas, but lower for others. The best estimate that could be made in the current work was that hypertension prevalence in the current rural population is at least as great as that in the cities. (Uddin et al.2024)

For heart disease mortality rates, the rural cohort had rates equal to some rural studies, and greater than others. For stroke mortality rates, the current rural cohort had twice the rate of another urban cohort, but lower than the rate for a different urban area. The stroke rate in the rural study was similar to that reported for the entire age group over the same 20-year period. (Hammond et al.2020)

1.6 4. Risk Factors

Impaired fasting glucose or impaired glucose tolerance is clearly associated with coronary heart disease and stroke risk in men and women, independent of other cardiovascular disease risk factors. So too is insulin resistance. There is also increasing evidence to suggest an association between the metabolic syndrome and increased cardiovascular risk, but it is not clear if this represents an independent effect or is simply of surrogate value reflecting the presence of such constituents as hypertension or abdominal obesity. There is evidence to suggest that adipocytokines and leptin are also involved since hyperleptinemia is associated with hypertension and other cardiovascular disease risk factors, as well as increasing common carotid artery intimal-medial wall thickness, and leptin and adiponectin deletion may increase cardiovascular disease risk, independent of other metabolic risk factors. (Kaneko et al.2021)

Low-density lipoprotein cholesterol is closely associated with cardiovascular disease risk, and high, low, and very low high-density lipoprotein cholesterols, triglycerides, a high apolipoprotein B/apolipoprotein A-1 ratio, and small dense LDL may also confer some cardiovascular risk. The apolipoprotein A-II level is also positively associated with coronary heart disease. Endothelial function has been associated with varying levels of many of these risk factors, and transendothelial excretion of macromolecules has been most closely linked to systolic blood pressure. Other data have shown that parathyroid hormone, N-terminal pro-brain natriuretic peptide, and homocysteine are each associated with cardiovascular disease, but despite the vigorous aging processes seen in the rural developing world, data are so far scarce. Despite this, it is clear that many traditional cardiovascular risk factors are well represented. (Yuyun et al.2020)

4.1. Environmental Factors

Environmental factors have been shown to be related to the development of CHD. Of particular concern is the evidence that suggests that CHD may be a pan-cultural disease; that is, certain lifestyle factors associated with current Western patterns of living, regardless of the racial group, are related to the risk factors for cardiovascular diseases on medical, physiological, or metabolic grounds. Moreover, many of the components of the Western lifestyle thought to contribute to the clustering of risk factors also occur singly or in mild form in so-called primitive societies, and levels of sex hormones, sodium intake, and dietary constituents, though variable, relate to cholesterol and blood pressure levels within as well as across populations. According to ecological studies, the incidence of myocardial infarction in some native tribal groups resident in the United States is low, and significantly lower among groups living in true aboriginal fashion. Average country and rural–urban differences in the degree of exposure to environmental factors are informally described in international documents. However, these data are almost impossible to compare, as they are compiled using large and often dissimilar definitions. Of the level of urbanization, rural populations comprise vastly different kinds of communities in terms of distance from settlements of various sizes and profiles. Any differences between the European and other world situations strongly depend on the meaning of rural areas or activities, which is given by the legal, historical, social, and cultural conditions of the various countries. Thus, each definition must

vary from one country to another, as it considers access to specific services or the level of provision of specific activities with different legal, regulatory, or organizational requirements. (Kalisch-Smith et al.2020)

4.2. Lifestyle Factors

The lifestyle factors that place the urban population at an increased risk for developing cardiovascular diseases have been widely discussed. The large proportion of the population in urban areas being in the high-risk category lends them a special place in public health policies. Heart diseases occur due to a combination of genetic factors, habits, and dietary indiscretion, which are often a part of the overall economic and social environments. Data from Chainama Hills Hospital in Lusaka support the view that lifestyle changes are occurring in urban areas and recommend that more research is required to validate the factors associated with stroke in the large and diverse African slum population. (Teo & Rafiq, 2021)

The urban-rural disparity in the prevalence of hypertension was reported from a study in rural South Africa. In both the pure urban group and the pure rural group, the majority of subjects had a low to moderate risk of getting myocardial infarction in the future, but the proportion was much less in Porbandar. The percentage of persons with low to moderate risk of myocardial infarction was far larger in the urban areas of Ahmedabad. The Dibrugarh data strongly indicate that there is an increased vulnerability for cardiovascular diseases secondary to behavior among urban citizens compared to rural citizens. The foundation for widening health inequalities between urban and rural areas is thus laid at birth, with enduring consequences for life expectancy. Furthermore, the health-related selection of the rural population may affect the demography and the effects, if not other characteristics, of urban-rural migration. These effects from urban-rural migration are important factors that have not been considered hitherto. (Cheng et al., 2022)

1.7 5. Conclusion and Implications

Few studies comprehensively compare the urban and rural cardiovascular health profiles of residents from the entire country by using one of the best datasets currently available in China. This paper utilized five aspects of CVD risk factors of a representative sample of adults aged 18 and older in China to compare the extent to which urban and rural residents have a favorable health profile. Firstly, after adjusting for age and taking individual and regional covariates as fully constant, our results showed that the absolute gap and the estimated probability in net deviation from each CVD risk factor suggested that urban residents had a higher risk of CVD than their rural counterparts. Furthermore, the weighted risk scores imply that, associated with each risk factor, urban dwellers consistently have worse levels of blood pressure, a hypertension history, higher fasting plasma glucose levels, bad physical behavior in relation to diet and cholesterol, and current smoking or a stroke history. In China, health inequality is a major public health and social issue, and rapid economic growth and urbanization bring about health disparities. Here, cardiovascular disease, which accounts for nearly half of all deaths, cannot be avoided. The results of this study should also make policymakers aware of the higher burdens of CVD risk factors for residents from both urban and rural localities and organize an acute awareness and effective interventions related to unhealthy behaviors associated with occupation, migration, and other contextual particularities, as well as facilitate tailored interventions. These findings could be used as evidence to support these tailored, accurate, and fit-for-purpose policy responses to reduce hazardous CVD risk factors, prevent CVD events, and contribute to policy decisions to promote CVD prevention and public health in China. (Wang & Stokes, 2020)

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