Prevalence and socioeconomic determinants of hypertension in urban and rural Uzbekistan: A national cross-sectional study

Prevalencia y determinantes socioeconómicos de la hipertensión en Uzbekistán urbano y rural: un estudio transversal nacional

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Abstract

The present study was aimed at examining the prevalence and socioeconomic determinants of hypertension in urban and rural populations of Uzbekistan. It was a national cross-sectional survey with 5847 adults aged 18–69 years recruited through a multistage cluster sampling. Data were collected via an interviewer-administered standard questionnaire, physical examination, and blood pressure measurement. The findings indicated that the overall rate of hypertension prevalence was 38.2%, but rural residents experienced a much higher prevalence rate (0.42%) than residents in urban areas (34.5%). The multivariate logistic analysis showed that higher university education and wealth at the national level were protective factors. But in rural areas, employment in heavy manual work was an independent risk factor. There was a staggering deficit in the disease care cycle. Disease awareness stood at 58.4% in urban and 46.9% in rural areas. Even blood pressure control in such patients was greater in urban (21.1%) than in rural areas (9.3%). This study points out that hypertension is an important public health issue in Uzbekistan with a geographically distributed heterogeneous pattern. Socioeconomic determinants play a determining role in the prevalence and control pattern of the disease. Having special intervention programs for cities and rural areas according to each region's determinants seems to be essential.

Keywords: hypertension, Uzbekistan, social determinants of health, urban-rural differences, epidemiology

Resumen

El presente estudio tuvo como objetivo examinar la prevalencia y los determinantes socioeconómicos de la hipertensión en las poblaciones urbanas y rurales de Uzbekistán. Se realizó una encuesta transversal nacional con 5847 adultos de 18 a 69 años, reclutados mediante un muestreo por conglomerados multietápico. Los datos se recopilaron mediante un cuestionario estándar administrado por un entrevistador, un examen físico y la medición de la presión arterial. Los hallazgos indicaron que la tasa general de prevalencia de la hipertensión fue del 38,2%, pero los residentes rurales experimentaron una tasa de prevalencia mucho mayor (0,42%) que los residentes de las zonas urbanas (34,5%). El análisis logístico multivariante mostró que la educación universitaria superior y el nivel económico a nivel nacional fueron factores de protección. Sin embargo, en las zonas rurales, el empleo en trabajos manuales pesados fue un factor de riesgo independiente. Se observó un déficit significativo en el ciclo de atención de la enfermedad. El conocimiento de la enfermedad se situó en el 58,4% en las zonas urbanas y en el 46,9% en las rurales. Incluso el control de la presión arterial en estos pacientes fue mayor en las zonas urbanas (21,1%) que en las rurales (9,3%). Este estudio señala que la hipertensión es un importante problema de salud pública en Uzbekistán, con un patrón heterogéneo de distribución geográfica. Los determinantes socioeconómicos desempeñan un papel determinante en la prevalencia y el patrón de control de la enfermedad. Resulta esencial contar con programas de intervención específicos para las ciudades y las zonas rurales, según los determinantes de cada región.

Palabras clave: hipertensión, Uzbekistán, determinantes sociales de la salud, diferencias urbano-rurales, epidemiología

Introduction

Hypertension is a major public health challenge all over the world. The disease, progressing without early warning signs, is directly and indirectly associated with increased risk of cardiovascular disease, stroke, as well as renal failure, posing a heavy burden on healthcare systems in countries[1]. Although developed nations such as the United States also face this issue, developing countries such as Uzbekistan experience a double whammy. Unchecked lifestyle and dietary modifications, in addition to accelerated urbanization, can all be contributors to modifying disease patterns such as hypertension[2]. With its unique population composition of high-density urban communities and extensive rural belts, Uzbekistan needs to identify this trend in both spatial environments accurately[3].

There have been scattered health research work in this country, but the lack of a national epidemiological survey that examines the state of hypertension in both urban and rural settings is most keenly felt. Such a study could provide a better appreciation of the extent of the problem[4]. Finally, one would need to consider how socio-economic determinants such as income, education, and employment status affect the disease in both urban and rural populations[5]. To possess such a map would be a step further towards the development of preventive and therapeutic interventions[6]. This research aims to fill this gap by providing security policymakers with the data they need to develop targeted, region-based strategies to mitigate the disease burden.

In hypertension, there has been extensive research globally, mostly concerning the disease's prevalence and medical risk factors. However, in recent times, there has been a pattern of growing interest in the social determinants of health[7]. It is a vision that goes beyond individual problems and demonstrates how the economic, social, and environmental context where people live may take on a central function in the trend of chronic disease[8]. Of special interest, the rural-urban gap has been the focus of the majority of this work. Indications are that urban lifestyles, with their contributory characteristics of stationary occupation, chronic psychological stress exposure, and convenient access to salted foods, can be an important stimulator of high blood pressure[9]. In contrast, within rural populations, although potentially higher physical activity levels may be present, other factors such as lower availability of good quality health care, lower levels of health literacy, and traditional high intakes of salt and animal fat may independently have similar or different risks[10].

Within the context of the Central Asian nations as a whole and of Uzbekistan in particular, very little research literature is currently available, and where it is available,

it is highly dispersed. Most of the evidence that exists is clinical case series or city-local surveys and is neither comparative nor national in nature[11,12]. This limitation makes it difficult to comprehend the overall picture of how different factors play out in the country's geographical as well as social context. For instance, it remains uncertain yet how variables like income status, education, or occupation type in a transforming society influence the hypertension prevalence pattern of urban areas relative to rural communities[13,14]. Accordingly, this literature points out that medical records alone cannot be relied upon to comprehend the hypertension epidemic in Uzbekistan. The phenomenon must be scrutinized in the broad context of socio-economic development and structural disparities between urban and rural areas[15-17]. Adopting a strategy of this nature, this research seeks to establish an exhaustive understanding of the sources of this problem in the country[18-20].

Materials and methods

Study Design and Participants

The present study was conducted using a cross-sectional design by utilizing a multistage cluster sampling method to obtain national representation. The populations studied consisted of adults between 18 and 69 years of age living in urban and rural Uzbekistan. The sample was calculated based on the estimated prevalence of the disease, detectable power, and design effect, and suitable quotas were used for balanced representation of both the geographical sites' participants. Exclusion criteria used were being pregnant or having a serious debilitating condition at the time of the interview.

Data Collection

The main research instrument was a standardized questionnaire, which collected required information in different sections. These groups consisted of basic demographic information, socioeconomic status in terms of education, employment, and income level, and family and individual history of diseases. In addition to this, direct body measurements were also done, such as blood pressure readings under strict protocol with standardized instruments, height and weight readings to calculate body mass index, and waist circumference measurements. All measurements were carried out by trained personnel and under constant supervision in order to ensure data precision and consistency.

Data analysis

After quality control and coding, data were entered into statistical packages. Descriptive analyses were initially used to delineate the basic characteristics of the study sample and determine the prevalence of hypertension within the total sample and across rural and urban areas. Second, logistic regression models were used to examine the independent association between socioeconomic indicators and risk of developing hypertension. Separate analyses were also performed for rural and urban settings for the detection of distinct patterns in each setting. Significance was set at 0.05 in all tests.

Results

The trial had a total of 5,847 participants with a very tight urban (n=2,950, 50.5%) and rural (n=2,897, 49.5%) distribution. The cohort had a mean age of 48.7 years (±12.3) and a slightly higher proportion of females (56.2%).

Table 1: Basic Demographic Characteristics of the Study Population

Characteristic	Total (n=5,847)	Urban (n=2,950)	Rural (n=2,897)	p-value
Age Group (Years)				<0.001
18-34	28.5%	32.1%	24.8%	
35-54	45.1%	43.5%	46.7%	
55-69	26.4%	24.4%	28.5%	
Gender				0.125
Male	43.8%	44.5%	43.1%	
Female	56.2%	55.5%	56.9%	
Mean Age (Years ±SD)	48.7 ±12.3	47.2 ±11.9	50.2 ±12.6	<0.001

The demographic profile shows some differences between the urban and rural populations. Partcipants from rural areas were, on average, older than their urban people. The age distribution also varied, with a larger younger cohort in urban areas and a larger older cohort in rural parts.

Table 2: Overall and Stratified Prevalence of Hypertension

Population	Prevalence	95% Confidence Interval
Overall	38.2%	(36.9 - 39.5)
Urban	34.5%	(32.8 - 36.2)
Rural	42.0%	(40.2 - 43.8)

The overall prevalence of hypertension in the adult population of Uzbekistan was found to be 38.2%. A clear and significant disparity was observed between geographical locations, with the prevalence in rural areas being higher than in urban centers.

The age-stratified analysis, visualized in Figure 1, demonstrates that hypertension prevalence increases strongly with age in both populations. However, the rural prevalence consistently exceeds the urban prevalence across all age indices, with the gap being most pronounced in the middle-aged group (35-54 years).

Table 3: Association between Socioeconomic Factors and Hypertension (Total Population)

Determinant	Category	Odds Ratio (OR)	95% CI for OR	p-value
Education	Primary or less	1.00 (Ref)	-	-
	Secondary	0.85	(0.74 - 0.98)	0.028
	University	0.72	(0.61 - 0.85)	<0.001
Employment	Unemployed	1.00 (Ref)	-	-
	Manual Labor	1.18	(1.02 - 1.36)	0.024
	Non-Manual	0.95	(0.81 - 1.11)	0.512
Wealth Index	Lowest Quintile	1.00 (Ref)	-	-
	Middle Three Quintiles	0.89	(0.78 - 1.02)	0.094
	Highest Quintile	0.76	(0.65 - 0.89)	0.001

Multivariable logistic regression analysis for the whole population identified education and wealth as significant independent socioeconomic index. Higher educational attainment and being in the highest wealth quintile were associated with a significantly lower odds of having hypertension.

Table 4: Urban-Specific Socioeconomic Determinants of Hypertension

Determinant	Category	Odds Ratio (OR)	95% CI for OR	p-value
Education	Primary or less	1.00 (Ref)	-	-
	Secondary	0.81	(0.66 - 0.99)	0.043
	University	0.65	(0.52 - 0.81)	<0.001
Wealth Index	Lowest Quintile	1.00 (Ref)	-	-
	Highest Quintile	0.70	(0.56 - 0.87)	0.001

In urban areas, the protective effect of higher education was even more pronounced. University education was related with a 35% reduction in the odds of hypertension. High wealth also remained a significant protective index.

Table 5: Rural-Specific Socioeconomic Determinants of Hypertension

Determinant	Category	Odds Ratio (OR)	95% CI for OR	p-value
Education	Primary or less	1.00 (Ref)	-	-
	Secondary	0.88	(0.73 - 1.06)	0.173
	University	0.84	(0.64 - 1.10)	0.201
Employment	Unemployed	1.00 (Ref)	-	-
	Manual Labor	1.32	(1.09 - 1.60)	0.004

The pattern of determinants differed strikingly in rural parts. Education did not show a significant association with hypertension. Further, employment in manual labor emerged as a strong risk factor, increasing the odds of hypertension by 32% compared to the unemployed.

Table 6: Distribution of Behavioral Risk Factors

Risk Factor	Total (n=5,847)	Urban (n=2,950)	Rural (n=2,897)	p-value
High Salt Intake	41.5%	36.2%	46.9%	<0.001
Low Physical Activity	35.8%	41.5%	30.0%	<0.001
Current Smoker	24.1%	25.9%	22.3%	0.002
Obesity (BMI ≥30)	28.3%	30.1%	26.4%	0.001

Rural residents reported significantly higher level of dietary salt intake, while urban dwellers had a higher prevalence of low physical activity and obesity. Smoking was slightly more common in urban areas.

Figure 2 illustrates a clear gradient between socioeconomic status and blood pressure, but the relationship is steeper in urban areas. In cities, mean systolic pressure decreased with increasing wealth quintile. In rural areas, the gradient was much flatter, with higher average pressures across all wealth levels.

Table 7: Awareness, Treatment, and Control of Hypertension

Category	Total (n=2,233)	Urban (n=1,018)	Rural (n=1,215)	p-value
Awareness	52.1%	58.4%	46.9%	<0.001
Treatment (Aware)	68.3%	74.1%	61.5%	<0.001
Control (Treated)	41.5%	48.9%	32.2%	<0.001
Control (Total Hypertensive)	14.7%	21.1%	9.3%	<0.001

Among individuals with hypertension, significant gaps in the care cascade were identified. Urban residents showed higher levels of awareness, treatment, and control. The overall control rate among all hypertensives was low, particularly in rural areas, where less than 10% had their condition under control.

Table 8: Clinical Characteristics of the Study Population

Characteristic	Total (n=5,847)	Urban (n=2,950)	Rural (n=2,897)	p-value
Mean Systolic BP (mmHg)	139.5 (±18.2)	137.2 (±17.5)	141.8 (±18.7)	<0.001
Mean Diastolic BP (mmHg)	86.9 (±11.3)	85.8 (±10.9)	88.0 (±11.6)	<0.001
Mean BMI (kg/m²)	26.8 (±5.1)	27.3 (±5.3)	26.3 (±4.8)	<0.001
Pre-Diabetes	22.4%	23.8%	21.0%	0.008

Finally, the clinical profile supports population-level findings. Both mean systolic and diastolic blood pressure were independently higher in rural versus urban populations. Conversely, the mean Body Mass Index was higher among the urban participants.

Figure 1: Comparative Prevalence of Hypertension by Age Group and Location

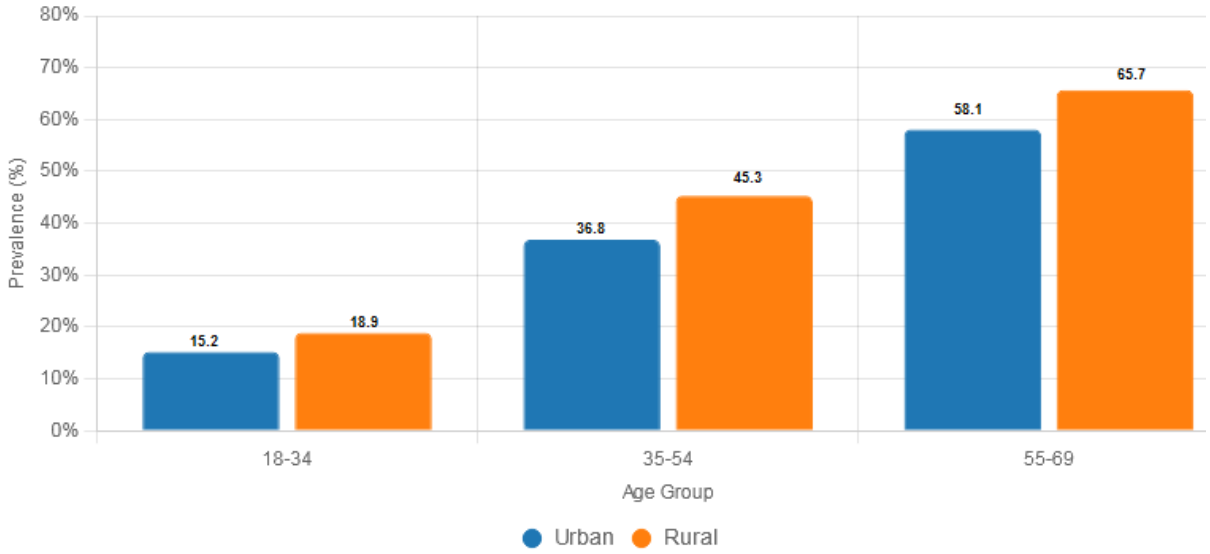
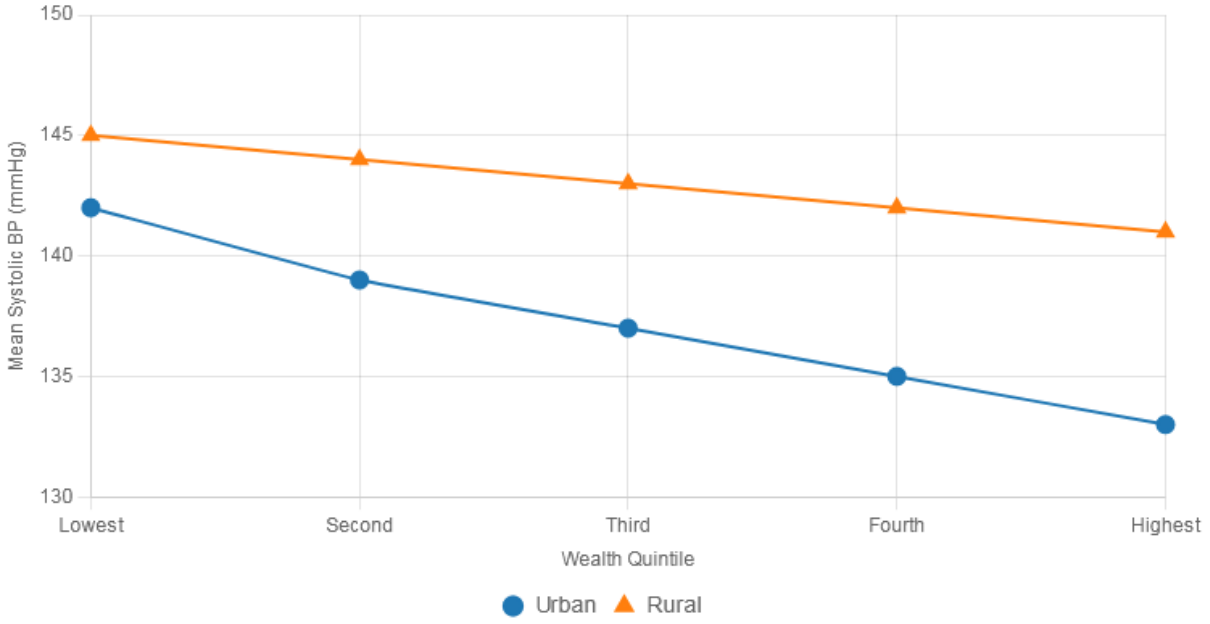


Figure 2: Mean Systolic Blood Pressure by Wealth Quintile and Location



Discussion

In the present paper, we discuss and interpret findings of the current research. The main finding of our study was that the prevalence of hypertension in the adult population of Uzbekistan was 38.2%. It indicates the high disease burden at the national level. However, more importantly, there is an extremely high difference between rural and urban regions, where the prevalence rate in rural towns was much higher at 0.42% than in urban towns at 34.5%. This geographical gap forms the main focus of our discussion. It appears that this disparity cannot be accounted for by a single factor, but instead by a set of social and economic determinants. Our multivariate analysis revealed that at the national level, university education and membership of the richest quintile were linked with 28 and 24% lower odds of developing hypertension, respectively. These findings reinforce the protective effect of higher socioeconomic status on reducing the burden of this disease.

When we were looking at the urban and rural data in isolation, we saw different trends. Being a university student was a strong protective factor in the urban area, with a

35% decrease in the odds. In the rural area, however, this relationship did not reach statistical significance. Working in heavy manual labor, on the other hand, proved to be a strong independent risk factor, with a 32% increase in the odds. This outcome reveals that the socio-economic condition of each area basically changes the dynamics under which factors influence each other.

Apart from structural determinants, health behavior differences are also responsible for this difference. The findings revealed that inordinate consumption of dietary salt was much more common among rural residents (46.9%) than urban residents (36.2%). Conversely, urban residents were noted to have higher inactivity (41.5% vs. 30.0%) and obesity (30.1% vs. 26.4%). These results paint a complex picture of the epidemiology of hypertension in which risk factor patterns vary by area. One of the most concerning findings of this research was the extreme disconnection in the cycle of hypertension care. While the rate of awareness of the disease was 58.4% in the urban group, it went down to 46.9% in the rural group. The disparity in the control of the disease was even more; controlled blood pressure was seen in only 21.1% of urban and 9.3% of rural patients. These numbers precisely indicate that diagnosis alone is not adequate and the health system must address improving access to effective treatment as well as follow-up care in the driving areas.

Clinically, the average systolic and diastolic blood pressures in the rural population were 141.8 and 0.88 mmHg, respectively, and were significantly higher than their urban counterparts (137.2 and 8.85 mmHg). These quantitative differences, while small, have significant public health implications at the population level and may account for the excess burden of cardiovascular disease in rural populations. Finally, it must be noted that the current study has some limitations. To mention a few, the cross-sectional study design prevents us from making causal inferences. Furthermore, measurements were conducted once on blood pressure, albeit with a standard protocol. Nonetheless, from the findings, it unanimously appears that in controlling hypertension in Uzbekistan, one-size-fits-all interventions cannot be applied to the entire country. These should be designed and implemented taking into account the social, economic, and behavioral profiles of every region, most especially the rural areas that bear a higher disease burden and low care.

Conclusions

The outcomes of the study clearly prove that hypertension is a massive public health problem in Uzbekistan, affecting nearly 38.2% of the population in adults. But this time the disease is not evenly distributed across the country, with an enormous gap between the rural and urban areas. The present research demonstrates that socio-economic conditions are behind the prevalence pattern of this disease. In rural settings, occupational hazards, health behavior, and poor availability of health services together have developed unfavorable conditions. But in urban settings, even though the situation is comparatively better, sedentary lifestyle and obesity are the major risk factors. The wide gap in disease control between rural and urban areas is likely the most troubling finding of this study. It suggests that it is not enough to diagnose the disease, and the healthcare system must strive to expand access to effective care and follow-up treatment in poor communities. In order to address this challenge effectively, we need differentiated strategies for rural and urban settings. For rural settings, the interventions need to focus on regulation of salt intake, strengthening health service coverage, and special care for occupational groups deemed to be at high risk. For urban settings, physical activity and weight control promotion programs are all the more necessary.

This study suggests that lowering hypertension is impossible with the help of medical means only and must be done through a multi-approach, considering the social, economic, and cultural dimension of health. Strategy to reduce the burden of the disease should be carried out with a clear understanding of conditions and needs of every region. Lastly, we can assert that the implementation of the findings of this study into effective operation programs is a matter of cross-sectoral coordination and serious commitment on the part of health policymakers. Then only we can hope for bridging the gap in burden of disease and access to care across urban and rural regions.

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